ALLEN'S IMPROVED CAMERA STAND.

Engraved Expressly for P. A. Journal.

THE PHOTOGRAPHIC ART JOURNAL.

VOLUME 3.—1852.

NEW YORK:
W. B. SMITH, Publisher,
No. 19 Beekman-street.

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THE

PHOTOGRAPHIC ART-JOURNAL.

Vol. 3. JANUARY, 1852. No. 1.

THE POETRY OF SCIENCE, OR STUDIES OF THE PHYSICAL PHENOMENA OF NATURE.*

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The phenomenon of thermo-electricity—the discovery of Seebeck, is another proof of the very close connection of the physical forces. We witness there being resolved as it were into each other, electricity producing heat, and heat again electricity: and it is from these curious results that the arguments in favor of their intimate relations and actual identity have been drawn. It will, however, be found to be the best philosophy to regard these forces dissimilar, until we are enabled to prove them to be only modified forms of one principle or power. At the same time it must not be forgotten that in natural operations we invariably find the combined action of several forces producing a single phenomenon. The important fact to be particularly regarded is, that we have evidence that every substance which is unequally heated, becomes the source of this very remarkable form of electricity.

There exists a few fishes gifted with the very extraordinary power of producing electrical phenomena by an effort of muscular or nervous energy.

The *Gymnotus electricus*, or electrical eel and the *Raia torpedo*, a species of ray are the most remarkable. This power is, it would appear, given to these curious creatures for purposes of defens e, and also for enabling them to secure their prey.

The *Gymnotus* of the South American rivers, will, it is said, when in full vigor, send forth a discharge of electricity sufficiently powerful to knock down a man, or to stun a horse ; while it can destroy fishes, through a considerable space, by exerting its strange artillery.

Farraday's description of a *Gymnotus*, paralyzing and seizing its prey, is too graphic and important to be omitted.

" The *Gymnotus* can stun and kill fish which are in very various positions to its own body ; but one day, when I saw it eat, its action seemed to me to be peculiar. A live fish, about five inches in length, caught not half a minute before, was dropped into the tub. The *Gymnotus* instantly turned round in such a manner as to form a coil, inclosing the fish, the latter representing a diameter across it ; a shock passed, and there, in an instant, was the fish struck motionless, as if by lightning, in the midst of the waters, its side floating to the light. The *Gymnotus* made a turn or two, to look for its prey, which, having found, he bolted, and went about searching for more. A second smaller fish was given him, which, being hurt in the conveyance, showed but little signs of life, and this he swallowed at once, apparently without shocking it. The coiling of the *Gymnotus* round its prey had, in this case, every appearance of being intentional on its part, to increase the force of the shock, and the action is evidently well suited for

* Continued from vol. 2, No. 6, p. 335.

that purpose, being in full accordance with the well-known laws of the discharge of current in masses of conducting matter; and though the fish may not always put this artifice in practice, it is very probable he is aware of its advantages, and may resort to it in cases of need.

Animal electricity has been proved to be of the same character as that derived from other sources. The shock and the spark are like those of the machine; and the current from the animal, circulating around soft iron, like Galvanic electricity, has the property of rendering it magnetic.

It is important that we should now review these conditions of electrical force in connexion with the great physical phenomena of nature.

It is sufficiently evident, from the results which have been examined, that all matter, whatever may be its form or condition, is for ever under the operation of the physical forces, in a state of disturbance. From the centre to the surface all is in an active condition; a state of mutation prevails with every created thing; and science clearly shows that influences are constantly in action which prevent the possibility of actual repose.

Under the excitement of the several agencies of the solar beams, motion is given to all bodies by the circulation of caloric, and a full flow of electricity is sent around the earth to perform its wondrous works. The solar influences, which we regard as light, heat, actinism, and electricity, are active in effecting an actual change of state in matter, and in all probability in influencing the great magnetic phenomena of the world. The sunbeam of the morning falls on the solid earth, and its influence is felt to the very centre. The mountain-top catches the first ray of light, and its base, still wrapt in mists and darkness, is disturbed by the irradiating power. The crystalline gems, hidden in the darkness of the solid rock, are dependent for that form which makes them valued by the proud, on the influence of those radiations which they are one day to refract in beauty. The metals locked in the chasms of the rifted rocks are, for all their physical peculiarities, as dependent on solar influence as is the flower which lifts its head to the morning sun, or the bird which sings "at heaven's high gate."

Let us, then, examine how far electricity as distinguished from the other powers, acts in producing any of these effects.

We find electricity in the atmosphere, in which it was first detected by the electrical kite of Dr. Franklin, and proved to be identical with that principle produced by the friction of glass. In the grandeur and terror of a thunder-storm many see nothing but manifestations of Almighty wrath. When the volleys of the bursting cloud are piercing the disturbed air, and the thunders of the discharge are pealing their dreadful notes above our heads, the chemical combinations of the noxious inhalations arising from the putrefying animal and vegetable masses of this earth are effected, and elements fitted for the purpose of health and vegetation are formed, and brought to the ground in the heavy rains which usually follow these storms. Science has taught man this—has shown him that the "partial evil" arising from the "winged bolt" is a "universal good;" and, more than this, it has armed him with the means of protecting his life and property from the influence of lightnings. By metallic rods, carried up a chimney, a tower, or a mast, we may form a channel through which the whole of the electricity of the most terrific thunder-cloud may be carried harmlessly into the earth or the sea; and it is pleasing to observe that at length prejudice has been overcome, and "conductors" are generally attached to high buildings, and to most of the ships of our navy. It was discovered that the devastating hailstorms of the south of France and Switzerland, so destructive to the vineyards and crops, were accompanied by evidences of great electrical excitation, and it was proposed to discharge the electricity from the air by means of pointed metallic rods. These have been adopted, and, it is said, with real advantage—each rod protecting an area of thirty or forty yards. Thus it is that science ministers to our service; and how much more pleasing is it to contemplate the lightning, with the philosopher, as an agent destroying the elements of pestilence, and restoring the healthfulness of the air we breathe, than with the romancer, to see in it only the dreaded aspect of a demon destruction.

It has been thought, and much satisfactory evidence has been brought forward to

support the idea, that the earth's magnetism is due to currents of electricity circulating around the globe; and the probability also derived from experiment is, that the great natural current is from east to west—that, indeed, it has an unvarying reference to the motion of the earth in relation to the sun.

These terrestrial currents, as they have without doubt a very important bearing on the structural conditions of the rock-formations and the distribution of minerals, require an attentive consideration; but we must, in the first place, examine as far as we know, the influences exerted, or supposed to be exerted, by atmospheric electricity.

The phenomena of vitality have, by many, been considered as immediately dependent upon its influence; and a rather extensive series of experiments might be quoted in support of this hypothesis. The researches of Philip on the action of the organs of digestion, when separated from their connection with the brain, but united with a Galvanic battery, have been proved by Dr. Reid to be delusive. Since, as the organ is not removed from the influence of the living principle, it is quite evident that the electricity here is only secondary to some more important power. Matteucci has endeavored to show that nervous action is due to electric excitation, and that electricity may be made a measurer of nervous irratability. There can be no doubt that a peculiar susceptibility to excitement exists in some systems, and this is very strikingly shown in the disturbances produced by electric action; but in the experiments which have been brought forward we have only the evidence that a certain number of muscular contractions are exhibited in one animal by a current of electricity, giving a measured effect by the Voltameter, which are different from those produced upon another by a current of the same power. An attempt has recently been made by Mr. A. Smee to reduce the electrical phenomena connected with vitality to a more exact system than had hitherto been done. We cannot, however, regard the attempt as successful. The author has trusted almost entirely to analogical reasoning, which is, in science, always dangerous. In the development of electricity, from what may be particularly distinguished as the vital force, we see only the phenomena produced by the action of any two dissimilar chemical compounds upon each other. It has been thought that the structure of the brain presents an analogy to that of the galvanic battery and the nerves represent the conducting wires Although, however, some of the conditions appear similar, there are many which have no representatives in either the mechanical structure or the physical properties of the brain, so far as we know it. That the brain is the centre, source, and termination of sensation is very clearly proved by phisiological investigations. · That the nerves are the media by which all sensation is conveyed to the brain, and also the instruments by which the will exerts its power over the muscles, is equally well established. But to say that we have any evidence to support the idea, that electricity has aught to do directly with these great physiological phenomena would be a bold assertion, betraying a want of due caution on the part of the investigator. That electric efforts are developed during the operations of vitallity is most certain. Such must be the case, from the chemical changes taking place during respiration and digestion, and the mechanical movements by which, even during external repose, the necessary functions of the body are carried on. Whether electricity is the cause of these, or an effect arising from them we need not stop to examine, as this is, in the present state of our knowledge, a mere speculation. We have no evidence that electricity is an exciting power, but rather that it is one of those forces which tend to establish the equilibrium of matter. When disturbed—when its equilibrium is overset—it does, in its efforts to regain its stability, produce most remarkable effects. An electrical machine must be rubbed to exhibit force. In all Galvanic arrangements, even the most simple, dissimilar bodies are brought together, and the latent electricity of both is disturbed; and, even in the magnet, it is only when this takes place, that its electrical powers are developed. In the *Gymnotus*, electricity appears to be dependent on the power of the will of the animal; but, even in this extraordinary fish it is under only peculiar conditions that the electrical excitement takes place, "and what they inflict they

feel" during the restoration of that equilibrium which is necessary to their healthy state. In every case, therefore, we see that some power far superior to this is the ultimate cause; indeed, light and heat, and probably actinism, appear to stand superior to this principle; and on these, in some combined mode of action, in all probability, sensible electricity is dependent. Beyond even these elements, largely as they are engaged in the organic and inorganic changes of this world, there are occult powers which may never be understood by finite beings. We advance step by step from the most solid to the most ethereal of material creations, and we examine a series of extraordinary effects produced by powers which we know not whether to regard as material or immaterial, so subtile are they. On these, it appears, we may exhaust our inductive investigations—we may discover the laws by which these principles act upon the grosser elements, and develop phenomena of a very remarkable kind which have been unobserved or misunderstood. Whether light, heat, and electricity are modifications of one power, or different powers very closely united in action, is a problem we may possibly solve; but to know what they are, appears to be beyond the hopes of science; and it were idle to dream of elucidating the causes hidden beyond these forces, and by which they are regulated in all their actions on dead or living matter.

During changes in the electrical conditions of the earth and atmosphere, vegetables give indications of being in a peculiar manner influenced by this power. It is proved by experiments that the leaves of plants are among the best conductors of electricity, and it has hence been inferred that it must necessarily be advantageous to vegatation. That vegetable growth is, equally with animal growth, subject to electricity as one of its quickening powers, must be admitted; but all experiments which have been fairly tried with the view of stimulating the growth of plants by its agency, have given results of a negative character. That a Galvanic arrangement may produce chemical changes in the soil, which may be advantageous to the plant, is probable; but that a plant can be brought to maturity sooner, or be made to develop itself more completely, under the direct action of electrical excitation, appears to be one of those dreams of science which will have a place amongst the marvels of alchemy and the fictions of astrology. An attentive examination of all the conditions necessary for the satisfactory development of the plant, will render it evident, that, although the ordinary electrical state of the earth and atmosphere must influence the processes of germination and vegetable growth, yet that any additional excitement must be destructive to them. The wonders wrought by electrical power are marvellous; a magic influence is exerted by it, and naturally the inquiring mind is led at first to believe that electricity is the all-powerful principle of creation; but a little reflection will serve to convince us that it is a subordinate agent although a powerful one.

In proceeding with our examination of the phenomena which present themselves in connection with the terrestrial currents, we purposely separate magnetism from those more distinct electro-chemical agencies, which play so important a part in the great cosmical operations.

Electricity, we have already stated, flows through or involves all bodies; but, like heat, it appears to undergo a very remarkable change in becoming associated with some forms of matter. We have the phenomena of magnetism when an electric current circulates through a metallic wire, and it would appear that all other bodies acquire a peculiar polar condition under the influence of this principle, which will be explained in the next chapter.

The rocks, taken as masses, will not conduct an electric current when dry: granite, porphyry, slate, and limestone obstructing its passage even through the smallest spaces. But all the metallic formations admit of its circulating with great freedom. This fact it must, however, be remembered does not in any way interfere with the hypothesis of the existence of electricity in all bodies, in what we must regard as its latent state, from which, under prescribed conditions, it may be readily liberated. Neither does it affect the question of circulation, in relation to the great diffusion of electricity which we suppose to exist through all nature, and to move in obedience to some fixed law. We know that through the superficial strata

electric current circulate freely, whether they are composed of clay, sand, or any mixture of these with decomposed organic matter ; indeed, that with any substance in a moist state they suffer no interruption.

The electricity of mineral veins has attracted much attention, and numerous investigations into the phenomena which these metalliferous formations present, have been made from time to time.

By inserting into the mass of a copper *lode*, in situ, a metallic wire, which shall be connected with a measurer of Galvanic action, a wire also from the instrument being brought into contact with another *lode*, an immediate effect is generally produced, showing that a current is traversing through the wires from one *lode* to the other, and completing the circulation probably over the damp face of the rock in which the fissures forming the mineral veins exist. The currents thus detected are often sufficiently active to deflect a magnetic needle powerfully, to produce slowly electro-chemical decomposition, and to render a bar of iron magnetic. These currents must not, however, be confounded with the great electrical movement on which we had speculated. They are only to be detected in those mineral formations in which there is evidence of chemical action going on, and the greater the amount of this chemical operation, the more energetic are the electrical currents. We have, however, very good evidence that these local currents have, themselves many peculiar influences. It not unfrequently happens that, owing to some great disturbance of the crust of the earth, a mineral vein is dislocated, and one part either sinks below, or is lifted above its original position ; the fissures formed between the two being usually filled in with clay or some crystalline masses of more recent formation than the fissure itself. It is frequently found that these "*cross courses*," as they are called in mining language, contain ores of a different character from those which constitute the mineral vein ; for instance, nickle, cobalt, and silver, are not unfrequently discovered in them. When these metals are so found, they almost invariably occur between the ends of the dislocated lode, and often take a curvilinear direction, as if they were deposited along a line of electrical force.

In the laboratory such an arrangement has been imitated, and in a mass of clay fixed between the Galvanic elements, after a short period, a distinct formation of a mineral vein has taken place. By the action, too, of weak electrical currents, Becquerel, Crosse, and others have been successful in imitating nature so far as to produce crystals of quartz and other minerals. In addition to this evidence, in support of the electrical theory of the origin of mineral veins, it can be experimentally shown that a schistose structure may be given to clays and sandstone by Voltaic action.

There is very often a very remarkable regularity in the direction of mineral veins : throughout Cornwall, for instance, they most commonly have a bearing from the E. of N. to the W. of S. It has hence been inferred that they observe some relation to the magnetic poles of the earth. However this may be, it is certain that the ore in any lodes which are in a direction at right angles, or nearly so, to this main line, differs in character from that found in these, so called, east and west lodes.

The sources of chemical action in the earth are numerous. Water percolating through the soil, and finding its way to great depths through fissures in the rocks, carries with it oxygen and various salts in solution. Water again rising from below, whether infiltrated from the ocean or derived from other sources, is usually of a high temperature, and it always contains a large quantity of a saline matter. By these causes alone chemical action must be set up. Chemical change cannot take place without a development of electricity : and it has been proved that the quantity of electricity required for the production of any change, is equal to that contained in the substances undergoing such change. Thus a constant activity is maintained within the caverns of the rock by the agency of the chemical and electrical elements, and mutations on a scale of great grandeur are constantly taking place under some directive force, probably magnetism.

The mysterious gnome, laboring—ever laboring—in the formation of metals, and the mischievous Cobalus of the mine, are the poor creations of superstition. A vague fear is spread amongst great masses of mankind relative to the condition of the

dark recesses of the earth ; a certain unacknowledged awe is experienced by many on entering a cavern or descending a mine: not the natural fear arising from the peculiarity of the situation, but the result of a superstitious dread, the effect of a depraved education, by which they have been taught to refer everything a little beyond their immediate comprehension to supernatural causes. The spirit of demon worship, as well as that of hero worship, has passed from the early ages down to the present ; and under its influence the genii of the East and the demons of the West have preserved their traditionary powers.

Fiction has employed itself with the utmost license in giving glowing pictures of treasures hidden in the earth's recesses. The caverns of Chilminar, the cave of Aladdin, the abodes of the spirits of the Hartz, and the dwellings of the fairies of England are gem-bespangled and gold-glistening vaults, to which man has never reached. The pictures are pleasing: but although they have the elements of poetry in them, and delight the young mind, they want the sterling test of scientific truth ; and the wonderful researches of the plodding mineralogist have developed more beauty in the caverns of the dark rock than ever fancy painted in her happiest moments.

In all probability the action of the sun's rays upon the earth's surface, producing a constantly varying difference of temperature, and also the temperature which has been observed as existing at great depths, give rise to thermo-electrical currents, which may also play an important part in these results, which are thus briefly described.

In connexion with these great natural operations, explaining them, and being also, to some extent, explained by them, we have the very beautiful application of the electrotype.

Applying the views we have adopted to this beautiful discovery, the whole process by which these metallic deposits are produced will be yet more clearly understood. By the agency of the electric fluid, liberated in the Galvanic battery, a disturbance of the electricity of the solution of copper, silver, or gold, is produced, and the metal is deposited ; but, instead of allowing the acid in combination to escape, it has presented to it some of the same metal as that revived, and, consequently, it combines with it and this compound, being dissolved, maintains the strength of the solution. A system of revival is carried on at one pole, and one of abrasion, or more correctly speaking, of composition and solution, or change of state, at the other pole. By taking advantage of this very extraordinary power of electricity, we now form vessels for ornament or use, we gild or silver all kinds of utensils, and give the imperishability of metal to the most delicate productions of nature—her fruits, her flowers, and her insects; and over the finest labors of the loom we may throw coatings of gold or silver to add to their elegance and durability. Nor need we employ the somewhat complex arrangement of the battery: we may take the steel magnet, and, by mechannically disturbing the electricity it contains, we can produce a current through copper wires, which may be used, and is extensively employed, for gilding and silvering. The earth itself may be made the battery, and by connecting wire with its mineral bodies, currents of electricity have been collected, and those currents used for the production of electrotype deposit.

The electrotype, as it has been called, is but one of the applications of electricity to the uses of man. This agent has recently been employed as the carrier of thought ; and with infinite rapidity messages of importance, communications involving life, and intelligences outstripping the speed of coward crime, have been communicated by its means. There will be no difficulty in understanding the principle of this, although many of the nice mechanical arrangements, to insure precision, are of a somewhat elaborate character. The entire action depends on the deflection of a compass-needle by the passage of an electric current along its length. If at a given point we place a Galvanic battery, and at twenty or one hundred miles' distance from it there is fixed a compass-needle, between a wire brought from and another returning to it, the needle will remain true to its polar direction so long as the wires are free from the excited battery ; but the moment connection is made, the electricity of the whole extent of wire is disturbed, and the needle is thrown at right angles to the direction of the current. Provided a con-

nection between two points can be secured, however remote they are from each other, we thus, almost instantaneously, convey any intelligence. The effects of an electric current would appear at a distance of 576,000 miles in a second of time ; and to that distance, and with that speed, is it possible, by Professor Wheatstone's beautiful arrangements, to convey whispers of love or messages of destruction.

The enchanted horse of the Arabian magician, the magic carpet of the German sorcerer, were poor contrivances, compared with the copper wires of the electrician, by which all the difficulties of time and the barriers of space appear to be overcome. In the Scandinavian mythology we find certain spiritual powers of evil possessed of the power of passing with imperceptible speed from one remote point to another, sowing the seeds of a common ruin amongst mankind. Such is the morbid creation of a wild yet highly endowed-imagination. The spirit of evil diffuses itself in a remarkable manner, and, indeed, we might almost assign to it the power of ubiquity ; but in reality its advance is progressive, and time enters as an element into any calculation on its diffusion. May we not hope that the electrical telegraph, making, as it must do, the whole of the civilized world enter into a communion of thought, and through thought, of feeling with each other, will bind us up in one common brotherhood, and that, instead of misunderstanding and of misinterpreting the desires and the designs of each other, we shall learn to know that such things as "natural enemies" do not exist? To hope to break down the great barrier of language is perhaps too much; but assuredly we may hope that, as we learn to know each other, as we must do when closer and more intimate relations are secured by the aids of science, the barrier of prejudice may be razed to the ground, and not one stone left to stand upon another ? Our contentions, our sanguinary wars, consecrated to history by the baptism of blood, have in every, or in nearly every, instance sprung from the force of prejudice, or the mistakes of politicians, whose minds were narrowed to the limits of a convention formed for perpetuating the reign of ignorance.

And can anything be more in accordance with the spirit of all that we revere as holy than the idea that the elements employed by the All Infinite in the works of physical creation shall be made, even in the hands of man, the ministering angels to the great moral redemption of the world ? Associate the distant nations of the earth, and they will find some common ground on which they may unite. Mortality compels a dependance ; and there are charities which spring up alike in the breast of the savage and the civilized man, which will not be controlled by the cold usages of pride, but which, like all truths, though in a still small voice, speak more forcibly to the heart than errors can, and serve as links in the great chain which must bind mankind in a common brotherhood. "None are all evil," and the best have much to learn of the amenities of life from him who yet lives in a "state of nature," or rather from him whose sensualities have prevailed over his intellectual powers, but who still preserves many of the noblest instincts, to give them no higher term, which other races, proud of their intelligence, have thrown aside. Time and space have hitherto prevented the accomplishment of this; electricity and mechanics promise to subdue both; and we have every reason to hope those powers are destined to accelerate the union of the vast human family.

Electrical power has also been employed for the purpose of measuring time, and by its means a great number of clocks can be kept in a state of uniform correctness, which no other arrangement can effect. A battery being united with the chief clock, which is itself connected by wires with any number of clocks arranged at a distance from each other, has the current continually and regularly interrupted by the beating of the pendulum, which interruption is experienced by all the clocks included in the electric circuit ; and, in accordance with this breaking and making contact, the indicators or hands move over the dial with a constantly uniform rate. Instead of a battery, the earth itself has supplied the stream of electric fluid, with which the rate of its revolutions have been registered with the utmost fidelity.

CHAPTER X.

MAGNETISM.

Magnetic Iron—Knowledge of, by the Ancients—Artificial Magnets—Electro-Magnets—Electro-Magnetism —Magneto-Electricity— Theories of Magnetism—The Magnetic Power of soft Iron and Steel—Influence of Heat on Magnetism—Terrestrial Magnetism—Declination of the Compass-needle—Variation of the Earth's Magnetism—Magnetic Poles—Hansteen's Speculations—Monthly and Diurnal Variation—Dip and Intensity—Thermo-Magnetism—Aurora Borealis— Magnetic Storms—Magnetic conditions of Matter—Dia-Magnetism, &c.

Agreeably with the view now generally received, that magnetism and electricity are but modifications of one force, since they are found to stand to each other in the relation of cause and effect, the separation which is here adopted, of the consideration of their several phenomena, may appear inappropriate. The importance, however, of all that is connected with magnetism, and the very decided difference which is presented by true magnetic action, and that of frictional or chemical electricity, is so great that it has been thought advantageous to adopt the present arrangement in reviewing the influences of terrestrial magnetism with which science has made us acquainted.

From a very early period a peculiar attractive force has been observed in some specimens of iron ore. Masses of this kind were found in Magnesia, and from that locality we derive the name given to iron in its polar condition. This is confirmed by the following lines by Lucretius :—

Quod superest agere incipiam, quo fœdere fiat
Natura lapis hic ut ferrum ducere possit,
Quem magnêta vocant patrio de nomine Graii
Magnêtum, quia sit patriis in finibus ortus.

Again we find Pliny employing the term *magnes*, to express this singular power. It was known to the ancients that the magnetic power of iron, and the electric property of amber, were not of the same character, but they were both alike regarded as miraculous. The Chinese and Arabians seem to have known it at a period long before that at which Europeans became acquainted with either the natural loadstone or the artificial magnet. Previously to A. D. 121, the magnet is distinctly mentioned in a Chinese dictionary ; and in A. D. 419, it is stated in another of their books that ships were steered south by it.

The earliest popularly received account of its use in Europe is, that Vasco de Gama employed a compass in 1427, when that really adventurous navigator first explored the Indian seas. It is highly probable, however, that the knowledge of its important use was derived from some of the Oriental nations at a much earlier period.

We have some curious descriptions of the *leading stone* or loadstone, in the works of an Icelandic historian, who wrote in 1068. The mariner's compass is described in a French poem of the date of 1181 ; and from Torfæus's History of Norway, it appears to have been known to the northern nations certainly in 1266.

We have not to deal with the history of magnetic discovery ; but so far as it tells of the strange properties which magnets are found to possess, and the application of this knowledge to the elucidation of effects occurring in nature.

A brown stone, in no respect presenting any thing by which it shall be distinguished from other rude stones around it, is found upon close examination, to possess the power of drawing light particles of iron towards it. If this stone is placed upon a table, and iron filings are thrown lightly around it, we discover that these filings arrange themselves in symmetric curves, proceeding from some one point of the mass to some other ; and upon examining into this, we shall find that the iron which has once clung to the one point, will be rejected by the other. If this stone is freely suspended, we shall learn also that it always comes to rest in a certain position,—this position being determined by these points, and some attractive force residing in the earth itself. These points we call its poles ; and it is now established that this rude stone is but a weak representative of our planet. Both are magnetic : both are so in virtue of the circulation of currents of electricity, or of lines of magnetic force, as seen in the curves formed by the iron dust, and the north pole of the one attracts the south pole of the other, and the contrary. By a confusion of terms, we speak of the north pole of a compass-needle, meaning that point which is always opposite to the north pole of the earth : the truth being that the pole of the compass-needle, which is so forcibly drawn to the north, is a point in a contrary state,

or, as we may express it, really a south pole.

There is a power of a peculiar kind, differing from gravitation, or any other attracting or aggregating force with which we are acquainted, which exists permanently in the magnetic iron stones, and also in the earth. What is this power?

Magnetism may be produced in any bar of steel, either by rubbing it with a loadstone, or by placing it in a certain position in relation to the magnetic currents of the earth, and, by a blow or any other means, disturbing its molecular arrangement. This principle appears to involve the iron as with an atmosphere, and to interpenetrate it. By one magnet we may induce magnetism in any number of iron bars without its losing any of its original force. As we have observed of the electrical forces already considered, the magnet constantly presents two points in which there is a difference manifested by the circumstance that they are always drawn with considerable power towards the north or south poles of the earth. That this power is of the same character as the electricity which we have been considering, is now most satisfactorily proved. By involving a bar of soft iron which, being without any magnetic power, is incapable of sustaining even an ounce weight, with a coil of copper wire, through which a galvanic current is passing, the bar will receive, by induction from the current, an enormous accession of power, and will, so long as the current flows around it, sustain many hundred pounds weight, which, the moment the current is checked, fall away from it in obedience to the law of gravity. Thus the mere flow of this invisible agent around a mass of metal possessing no magneto-attractive power, at once imparts this life-like influence to it, and as long as the current is maintained, the iron is endowed with this surprising energy.

This discovery, which we owe to the genius of Oersted, and which has, indeed, given rise to a new science, electro-magnetism, may be regarded as one of the most important additions made to our knowledge.

Current electricity is magnetic; iron is not necessary to the production of magnetic phenomena, although by its presence we secure a greater amount of power. The copper wires which complete the circuit of a galvanic battery will attract and hold up large quantities of iron filings, and the wires of the electric telegraph will do the same, while any signal is being passed along the line. Again, all the phenomena common to galvanic electricity can be produced by merely disturbing the power permanently secured in the ordinary magnet. It was thought that magnets would become weakened by this constant disturbance of their magnetism; but, since its application to the purposes of manufacture and magneto-electricity has been employed in electro-plating, it has been found that continued action for more than a year during which enormous quantities of electricity have been thus given out and employed in producing chemical decomposition, has not, in the slightest degree altered their powers.

Thus a small bar of metal is shown to be capable of pouring out, for any number of years, the principle upon which the phenomena of magnetism depends.

There are, however, differences, and striking ones, between ordinary and magnetic electricity. In the magnet, we have a power at rest, and in the electrical machine or galvanic battery, a power in motion. Ordinary electricity is stopped in its passage by a plate of glass, of resin, and many other substances; but magnetism passes these with freedom, and influences magnetic bodies placed on the other side. It would appear, though we cannot explain how, that magnetism is due to some lateral influence of the electric currents. A magnetic bar is placed over a copper wire, and it hangs steadily in the direction of its length; an electric current is passed along it, and the magnet is at once driven to place itself across the wire. Upon this experiment, in the main, Ampère founds his history of terrestrial action of any fixed magnetic poles, but from the repulsion of these currents, as is the case with the wire.

It has been found that wires, freely suspended, along which currents were passing in opposite directions, revolve about each other, or have an inclination to place themselves at right angles, thus exhibiting the same phenomenon as the magnet and the conducting wire. So far, the hypothesis of Ampère leads us most satisfactorily. We see in the magnet one form of electricity, and in the machine or battery another.

But why should not the electricity of the magnet, electricity at rest, exhibit the same powers as this force in motion?

Oersted, whose theory led him to the discovery of the fact of electro magnetic action, regards the phenomena of a current passing a wire, and its action on a needle, as evidence of two fluids, positive and negative, traversing in opposite directions, and mutually attracting and repelling, so that, indeed, they pass the wires in a series of spirals; that in the magnet, by some peculiar property of the iron, this conflict of the currents is reduced to an equilibrium, and its power becomes manifested in its attractive force. It is a curious fact that iron becomes magnetic in a superior degree to any other metal; that steel permanently retains any magnetism imparted to it; but that soft iron rapidly loses its magnetic power. This must be in virtue of some peculiar arrangement of the molecules, or some unknown physical condition of the atoms of the mass, by which a continued influence is retained by the steel probably in a state of constant internal circulation. It has, however, been shown that soft iron, under certain circumstances, may be made to retain a large amount of magnetic force.

If a horse-shoe shaped bar of soft iron is rendered magnetic by the circulation of an electric current around it, while its two ends are united by an armature, of soft iron also, so that while the current is passing it is capable of supporting many hundred pounds weight; it will be found that a considerable weight may be supported when the current is stopped, provided the armature is carefully kept in contact, and it will retain this power for many years; but remove the connecting piece of iron and the bar immediately loses all its magnetism, and will not support even the armature itself. This fact appears to confirm the idea that magnetism is due to the retention of electricity, and that steel possesses the property of equalizing the opposing forces, or of binding this principle to itself like an atmosphere.

The influence of heat on magnetism is so remarkable a proof of the dependence of this power upon molecular arrangement, that it must not escape our notice. To select but one of many experiments by Mr. Barlow, it was found that in a bar of malleable iron, in which the magnetic effect when cold was—30°, all polarity ceased at a white heat, that it was scarcely appreciable at a red heat, but that at a blood-red heat it was equal to—41°.

The more closely we examine the peculiarities of the magnetic power, and particularly as they are presented to us in its terrestrial action, the more surprising will its influences appear to be. We have discovered a natural cause which certainly exercises a very remarkable power over matter, and we have advanced so far in our investigations as to have learnt the secret of converting one form of force into another, or of giving to a principle, produced by one agency, a new character under new conditions; of changing, in fact, electricity into magnetism, and from magnetism again evolving many of the effects of electrical currents.

If a magnetic bar is freely suspended above the earth, it takes, in virtue of some terrestrial power, a given direction, which is an indication of the earth's magnetic force. Whether this is the consequence of the currents of electricity, which Ampère supposes to circulate around the globe, from east to west, or the results of points of attraction in the earth itself, the phenomenon is equally wonderful. To whatever cause we may refer the visible effects, it appears certain that this earth is composed of particles in a magnetic state, the character varying with physical conditions, and that terrestrial magnetic force is the collective action of all the atoms of this planetary mass.

The constancy with which a magnetized needle points to a certain spot, renders it one of the most important instruments to the practical and scientific man. The wanderer of the ocean or of the desert is enabled, without fear of error, to pursue his path amid unknown regions to determine the azimuth of objects. The miner or the surveyor, finds in the magnetic compass the surest guide in his labors, and the experimentalist is for ever studying its indications

"True as the needle to the pole."

has passed into a proverb among mankind, but the searching inquiry of modern observers has shown that the expression is correct only with certain limitations. There are but two lines on the surface of the earth on which the needle points true north, or where the magnetic and the geographical

north correspond. These are called lines of *no variation*, or, as they have also been designated, *agonic lines*, and one is found in the eastern and the other in the western hemisphere. The American line is singularly regular, passing in a south-east direction from latitude 60° to the west of Hudson's Bay, across the American lakes, till it reaches the South Atlantic ocean, and cuts the meridian of Greenwich in about 65° south latitude. The Asiatic line of *no variation* is very irregular, owing, without doubt to local interferences ; it begins below New Holland, in latitude 60° south, it bends westward across the Indian ocean, and from Bombay has an inflection eastward through China, and then Northward across the sea of Japan, till it reaches the latitude of 71° north, when it descends again Southward, with an immense semicircular bend, which terminates in the White Sea.

Hansteen has thought that there are two points in each hemisphere which may be regarded as stronger and weaker poles on opposite sides of the poles of revolution. These are called the magnetic poles of the earth, or by Hansteen *magnetic points of convergence*. These four points are considered to have a regular motion round the globe, the two northern ones from west to east, and the two southern ones from east to west. By the assistance of recorded observations, Hansteen has calculated the periods of revolutions to be as follows :—

The weakest north pole in 860 years.
The strongest north pole in 1746 years.
The weakest south pole in 1304 years.
The strongest south pole in 4690 years.

There are some points of speculation on which Hansteen has ventured which have been smiled at as fanciful ; but they may rather indicate an amount of knowledge in the Brahminical and Egyptian priesthood, beyond what we are usually disposed to allow them, and prove that their observations of nature had led to an appreciation of some of the most remarkable harmonies of this mysterious creation.

The above terms are exceedingly near 864, 1246, 1728, 4320, and those numbers are equal to the mystic number of the Indians, Greeks, and Egyptians, 432 multiplied by 2, 3, 4, and 10. On these the ancients believed a certain combination of natural events to depend, and, according to Brahminical mythology, the duration of the world is divided into four periods, each of 432,000 years. Again, the sun's mean distance from the earth is 216 radii of the sun, and the moon's mean distance 216 radii of the moon, each the half of 432. Proceeding with this very curious examination, Hansteen says, 60 multiplied by 432 equals 25,920, the smallest number divisible at once by all the four periods of magnetic revolution, and hence the shortest time in which the four poles can complete a cycle, and return to their present state, and *which coincides exactly with the period in which the process of the equinoxes will amount to a complete circle*, reckoning the procession at a degree in seventy-two years.

When we consider the phenomena of terrestrial magnetism carefully, it appears to indicate the action of a power external to the earth itself, and, as Hansteen conceives, having its origin from the action of the sun, heating, illuminating, and producing a magnetic tension, in the same manner as it produces electrical excitation and actino-chemical action.

The movements of these magnetic poles have been the subject of extensive and most accurate observation in every quarter of the globe. In London, during 1657-1662, there was no magnetic variation ; the agonic line passing through it. The variation steadily increased, until, in 1815, it amounted to 24° 15′ 17″, since which time it has been slowly diminishing. In addition to this great variation, we have a regular annual change dependent on the position of the sun, in reference to the equinoctial and solstitial points, which has been discovered by Cassini, and investigated by Arago and others. Also a diurnal variation, which movement appears to commence early in the morning, moving eastward until half-past seven A. M., when it begins to move westward until two P. M., when it again returns to the east, and in course of the night reaches the point from which it started twenty-four hours before.

We have also remarkable variations in what is termed the *dip* of the needle. It is well known that a piece of unmagnetized steel, if carefully suspended by its centre, will swing in a perfectly horizontal position, but, if we magnetize this bar, it will immediately be drawn downwards at one end

The force of the earth's polarity, attracting the dissimilar pole, has caused it to *dip*.

There is, in the neighborhood of the earth's equator, and cutting it at four points an irregular curve, called the magnetic equator, or *aclinic* line, where the needle balances itself horizontally. As we proceed from this line towards either pole the dip increases, until, at the north and south poles, the needle takes a vertical position. The *intensity* of the earth's magnetism is also found to vary with the position, and to increase in a proportion which corresponds very closely with the dip. But the *intensity* is not a function of the dip, and the lines of equal intensity *isodynamic lines*, are not parallel to those of equal dip. We have already remarked on the diurnal variation of the declination of the needle; we know, also, that there exists a regular monthly and daily change in the magnetic intensity. The greatest monthly change appears when the earth is in its perihelion and aphelion, in the months of December and June—a maximum then occurs; and about the time of the equinoxes, when our planet is at the greatest mean distance from the sun, a minimum is detected.

The daily variation of intensity is greatest in the summer, and least in the winter. The magnetism is generally found to be at a minimum when the sun is near the meridian; its intensity increasing until about six o'clock, when it again diminishes.

What striking evidence all the well-ascertained facts give of the dependence of terrestrial magnetism on solar influence; and in further confirmation of this view, we find a very remarkable coincidence between the lines of equal temperature—the isothermal lines, and those of equal dip and magnetic intensity.

Sir David Brewster first pointed out that there were, in the northern hemisphere, two poles of maximum cold; these poles agree with the magnetic points of convergence; and the line of maximum heat, which does not run parallel to the earth's equator, is nearly coincident with that of magnetic power. Since Seebeck has shown us that electrical and magneto-electrical phenomena can be produced by the action of heat upon metallic bars, we have, perhaps, approached towards some faint appreciation of the manner in which the solar calorific radiations may, acting on the surface of our planet, produce electrical and magnetic effects. If we suppose that the sun produces a disturbance of the earth's electricity along any given line, in all directions at right angles to that line, we shall have magnetic po arity induced. That such a disturbance is regularly produced every time the sun rises has been sufficiently proved by many observers.

In 1750, Wargentin noticed that a very remarkable display of *Aurora borealis* was the cause of a peculiar disturbance of the magnetic needle; and Dr. Dalton was the first to show that the luminous rays of the Aurora are always parallel to the dipping-needle, and that the Auroral arches cross the magnetic meridian at right angles. Hansteen and Arago have attended with particular care to these influences of the Northern Lights, and the results of their observations are:—

That as the crown of the Aurora quits the usual place, the dipping-needle moves several degrees forward:

That the part of the sky where all the beams of the Aurora unite, is that to which a magnetic needle directs itself, when suspended by its centre of gravity:

That the concentric circles, which show themselves previously to the luminous beams, rest upon two points of the horizon equally distant from the magnetic meridian; and that the most elevated points of each arch are exactly in this meridian.

It does not appear that every Aurora disturbs the magnetic needle; as Captains Foster and Back both describe very splendid displays of the phenomena, which did not appear to produce any tremor or deviation upon their instruments.

Some sudden and violent movements have been from time to time observed to take place in suspended magnets; and since the establishment of magnetic observatories in almost every part of the globe, a very remarkable coincidence in the time of these agitations has been detected. They are frequently connected with the appearance of the Aurora borealis; but this is not constantly the case. These disturbances have been called *magnetic storms;* and over the Asiatic and European continent, the Islands of the Atlantic and western hemisphere, they have been proved to be simultaneous.

From observations made at Petersburg

by Kupffer, and deductions drawn from the observations obtained by the Magnetic Association, it appears probable that these *storms* arise from a sudden displacement in the magnetic lines of the earth's surface; but the cause to which this may be due is still to be sought for.

In the brief and hasty sketch which has been given of the phenomena of terrestrial magnetism, enough has been stated to show the vast importance of this very remarkable power in the great operations of nature. We are gradually reducing the immense mass of recorded observations, and arriving at certain laws which are found to prevail. Still, the origin of the force, whether it is the circulation of magnetic fluid, or whether it is merely a peculiar excitation of some property of matter, are questions which are open for investigation.

In the beautiful Aurora borealis, with its trembling diffusive lights, and its many-colored rays, we have what may be regarded as a natural exhibition of magnetism, and we appear to have within our grasp the explanation we desire. But we know not the secret of even these meteorological displays. If we pass an electric spark from a machine through a long cylinder, exhausted of air as far as possible, we have a mimic representation of the Northern Lights—the same attenuation of brightness, almost dwindling into phosphorescence; and by the slightest change of temperature, we may produce that play of colors, which is sometimes so remarkably manifested in Aurora. Dr. Dalton considered Aurora borealis *as a magnetic phenomenon, and that its beams are governed by the earth's magnetism.* We know that they are of light produced between the poles of a powerful galvanic battery is readily deflected by a good magnet; and we have lately learned that every vapor obeys the magnetic force. It is, therefore, yet a question for our consideration, does the earth's magnetism produce the peculiar phenomena of Aurora by acting upon electricity in a state of glow? or have we evidence in this display, of the circulation of the magnetic fluid round our globe, manifesting itself by its action on the ferruginous and other metallic matter, which Fusinieri has proved to exist in the upper regions of our atmosphere.

The alteration in the properties of heat, when it passes from the radiant state into combination with matter, exhibits to us something like what we may suppose occurs in the conversion of magnetism into electricity or the contrary. We have a subtile agent, which evidently is forever busy in producing the necessary conditions of change in this our earth: an element to which is due the development of many of the most active powers of nature; performing its part by blending with those principles which we have already examined; associating itself with every form of matter; and giving, as we shall presently see, in all probability, the first impulses to combination and regulating the forms of aggregating particles.

As electricity has the power of altering the physical conditions of the more adherent states of matter, thus giving rise to variations of forms and modes of combination, so gross matter appears to alter the character of this agency, and thus dispose it to the several modifications under which we have already detected its presence. We have mechanical electricity and chemical electricity, each performing its great work in nature; yet both manifesting conditions so dissimilar, that tedious research was necessary before they could be declared identical. Magnetic electricity is a third form; all its characteristics are unlike the others and the office it appears to perform in the laboratory of creation, is of a different order from that of the other states of electrical force. In the first two we have decomposing and recombining powers constantly manifested, in fact, their influences are always of a chemical character; but in the last it appears we have only a directive power. It was thought that evidence had been detected of a chemical influence in magnetism; it did appear that sometimes a retarding force was exerted, and often an accelerating one. This has been again denied, and we have arrayed in opposition to each other some of the first names among European experimentalists. The question is not yet to be regarded as settled; but from long and tedious investigation, during which every old experiment has been repeated, and numerous new ones tried, we incline to the conclusion that chemical action is not directly affected by magnetic power. It is highly probable that magnetism may, by altering the structural arrangement of the surface, vary the

rate of chemical action, but this requires confirmation.

There is no substance to be found in nature existing independently of magnetic power. But it influences bodies in different ways : one set acting with relation to magnetism, like iron, and arranging themselves along the line of magnetic force,—these are called magnetic bodies ; another set, of which bismuth may be taken as the representative, always placing themselves at right angles to this line,—these are called dia-magnetic bodies. This is strickingly shown by means of powerful electro-magnets, but the magnetism of the earth is sufficient, under proper care, to exhibit the phenomena.

Every substance in nature is in one or other of these conditions. The rocks, forming the crust of the earth, and the minerals which are discovered in them ; the surface soil, which is by nature prepared as the fitting habitation of the vegetable world, and every tree, shrub, and herb which find root therein, with their carbonaceous matter, in all its states of wood, leaf, flower and fruit; the animal kingdom, from the lowest monad through the entire series up to man,—have, all of them, distinct magnetic or dia-magnetic relations.

"It is a curious sight," says Dr. Faraday, "to see a peice of wood or of beef, or an apple, or a bottle of water repelled by a magnet, or, taking the leaf of a tree, and hanging it up between the poles, to observe it take an equatorial position. Whether any similar effects occur in nature among the myriads of forms which, upon all parts of its surface, are surrounded by air, and are subject to the action of lines of magnetic force, is a question which can only be answered by future observation.

At present, the bodies which are known to exhibit decided ferro-magnetic properties, are the following, which stand arranged in the order of their intensity :—

Iron, Nickel, Cobalt, Manganese,
Chromium, Cerium, Titanium,
Palladium, Platinum, Osmium.

It is interesting to know that there are evidences that two bodies, which, when separate, are not magneitc, as iron is, become so when combined. Copper and zinc are both of the dia-magnetic class, but many kinds of brass are discovered to be magnetic.

The salts of the above metals are, to a greater or less extent, ferro-magnetic, but they may be rendered neutral by water, which is a dia-magnetic body, being repelled by the magnet. It will be unnecessary, here, to enumerate the class of bodies which are dia-magnetic ; indeed, all not included in the preceding list may be considered as belonging to that class, with the exceptions of gases and vapors, which appear to exist, relatively to each other, sometimes in the one, and sometimes in the other.

To endeavor to reduce our knowledge of these facts to some practical explanation, we must bear in mind that particular spaces around the north and south geographical poles of the earth are regarded as circles to which all the magnetic lines of force converge. Under circumstances which should prevent any interference with what is called ferro-magnetic action, all bodies coming under that class would arrange themselves, according to the laws which would regulate the disposition of an infinite number of magnets, free to move within the sphere of each other's influence. The north and south pole of one magnetic body would attach itself to the south and north pole of another, until we had a line of magnets of any extent ; the two ends being in opposite states, like the magnetic points of convergence of the earth.

Every body, not ferro-magnetic, places itself across such a line of magnetic force as we have conceived ; and if the earth was made up of separate layers of ferro-magnetic and dia-magnetic bodies, the result would be the formation of bands at right angles to each other. This is not the case, by reason of the intermingling of the two classes of substances. Out of the known chemical elements we find only about ten which are actively ferro-magnetic ; the others combining with these give rise to either a weaker state, a neutral condition, or the balance of action is turned to the dia-magnetic side. Sulphate of iron, for instance, is a magnetic salt ; but in solution, water being dia-magnetic, it loses its property. The yellow prussiate is a dia-magnetic body ; but the red prussiate, which contains an atom less of potassium is magnetic.

These two conditions of matter stand, therefore, in opposition ; and as every particle of any substance found in this earth

is endued with the property of disposing itself according to one or the other of these powers, we appear to be approaching to a knowledge of the cause of molecular arrangements.

We still search in the dark, and see but dimly the evidences; yet it becomes almost a certainty to us, that this stone of granite, with its curious arrangement of felspar, mica, and quartz, presents its peculiar condition in virtue of some such law as that of dia-magnetism. The crystal, too, of quartz, which we break out of the mass, and which presents to us a beautiful regular figure, is, beyond a doubt, so formed, because the atoms of silica are each one impelled in obedience to one of these two forms of magnetism to set themselves in a certain order to each other, which cannot be altered by human force without destruction.

All the laws which regulate the forms of crystals and amorphous bodies are to the greatest degree, simple. In nature, the end is ever attained by the easiest means; and the complexity of the operation, which appears sometimes to the observer, is only so because he cannot see the spring by which the machine is moved.

The gaseous envelop, our atmosphere, is in a neutral state. Oxygen is strikingly magnetic in relation to hydrogen gas, whilst nitrogen is as singularly the contrary; and the same contrasts present themselves when these gases are examined in their relation to common air. Thus, oxygen being magnetic, and nitrogen the contrary, we have an equilibrium established, and the result is a compound, neutral in its relations to all matter. All gases and vapors are found to be dia-magnetic, but in different degrees. This is shown by passing a stream of the gas, rendered visible by a little smoke, within the influence of a powerful magnet. These bodies are, however, found relatively to each other,—or even to themselves, under different thermic conditions,—to change their states, and pass from the magnetic to the dia-magnetic class.

Heat has, however, a very remarkable influence in altering these relations; and atmospheric air at one temperature is magnetic to the same fluid at another; thus, by thermic variations, attraction or repulsion is alternately maintained. By this it must be understood that a stream of air, at a temperature elevated but a few degrees above that of an atmosphere of the same kind into which it is passing, is deflected in one way by a magnet; whereas, if the stream is colder than the bulk through which it flows, it is bent in another way by the same force. In this respect, magnetism and dia-magnetism show equally the influence of another physical force, heat; and we may safely refer many meteorological phenomena to similar alterations of condition in the atmosphere, relative to the magnetic relations of the aërial currents.

That magnetism has a directive power is satisfactorily shown by the formation of crystals in the neighborhood of the poles of powerful magnets. The common iron salt, the proto-sulphate, ordinarily crystallizes, so that the crystals unite by their faces; but, when crystallizing under magnetic influence, they have a tendency to arrange themselves with regard to each other, so that the acute angle of one crystal unites with one of the faces of another crystal, near to, but never actually at, its obtuse angle. In addition to this, if a magnet of sufficient power is employed, the crystals arrange themselves in magnetic curves from one pole to the other, a larger crop of crystals being always formed at the north than at the south pole. Here we have evidence of an actual turning round of the crystal, in obedience to the directive force of the magnet; and we have the curious circumstance of a difference in some way, which is not clearly explained, between the two opposite poles. If, instead of an iron, or a ferro-magnetic salt, we employ one which belongs to the other or dia-magnetic class, we have a curious difference in the result. If into a glass dish, fixed on the poles of a strong electro-magnet, we pour a quantity of a solution of nitrate of silver, and place in the fluid, over the poles of the magnet, two globules of mercury, by which that arborescent crystallization, called the *Arbor Dianæ*, is produced, we have the long needle-shaped crystals of silver, arranging themselves in curves which would cut the ordinary magnetic lines at right angles.

In the first example given, we have an exhibition of magnetic force, while in the last we have a striking display of the dia-magnetic power.

The large majority of natural formations

appear to group themselves under the class of dia-magnetics. These bodies are thought to possess poles of mutual repulsion among themselves, and which are equally repelled by the magnetic points of convergence. Confining our ideas to single particles in one condition or the other, we shall, to a certain extent, comprehend the manifold results which must arise from the exercise of these two modes of force. At present, our knowledge of the laws of magnetism is too limited to allow of our making any general deductions relative to the disposition of the molecules of matter; and the amount of observation which has been given to the great natural arrangements, is too confined to enable us to infer more than that it is probable many of the structural conditions of our planet are due to some polar action.

Mountain ranges observe a singular uniformity of direction, and the cleavage planes of rock are evidently due to some all-pervading power. Mineral bodies are not distributed in all rocks indiscriminately. The primary formations hold one class of metalliferous ores, and the more recent ones another. This is not to be regarded as in any way connected with their respective ages, but with some peculiar condition of the stone itself. The granite and slate rocks, at their junctions, present thè required conditions for the deposit of copper ore, while we find the limestones have the characteristic physical state for accumulating lead ore. Again, on examining any mineral vein, it will be at once apparent that every particle of ore, and every crystal of quartz or limestone, is disposed in a direction which indicates the exercise of some powerful directive agency.

It appears, from all the results hitherto obtained, that the magnetic and dia-magnetic condition of bodies is equally due to some peculiar property of matter in relation to the other forms of electricity. We have not yet arrived at the connecting link, but it does not appear to be far distant.

We have already referred to the statement made by talented experimentalists, that magnetism has a powerful influence in either retarding or accelerating chemical combination. Beyond a doubt chemical action weakens the power of a magnet; but the disturbance which it occasions in soft iron, on the contrary, appears to tend to its receiving magnitism more readily, and retaining it more permanently. Further investigations are, however, required before we can decide satisfactorily either of these problems, both of which bear very strongly upon the subject we have just been considering.

We have seen that heat and electricity act strangely on magnetic force, and that this statical power reacts upon them; and thus the question naturally arises, Do light and magnetism in any way act upon each other?

Morichini and Carpi on the continent, and Mrs. Somerville in England, have stated that small bars of steel can be rendered magnetic by exposing them to the influence of the violet rays of light. These results have been denied by others, but again repeated and apparently confirmed. In all probability the rays to which the needles were exposed, being those in which the maximum actinic power is found, produced an actual chemical change; and then, if the position were favorable, it is quite evident that magnetism would be imparted. Indeed, we have found this to be the case when the needles, exposed to solar radiations, were placed in the direction of the dip. The supposed magnetization of light by Faraday has already been mentioned. If the influence in one case is determined, it will render the other more probable.

To be continued.

CHROMATIC BACKGROUND.

MR. SNELLING.—DEAR SIR:—Should you have a small retired corner in your truly useful Journal to spare, allow me to fill it with a brief description of an improved background, invented by myself at the time we were all so anxiously looking forward to that "Mons parturiens" the Hillotype. I have named it the "*chromatic background*," from the facility with which any colored surface may be placed behind the sitter, which in the case above mentioned, would have been a desirable object. It has been in use among several members of the Photographic Institute, and I may safely say, much to their satisfaction. As a background for the Daguerreotype, it gives a wooliness and softness of tone, not easily produced by any other medium. For Calotype it is unsurpassed. It consists of two wooden frames, of any size required. One of them, on feet as usual, is covered with a light yellow canvas or cloth, strained on it or not. This screen stands perpendicular on the floor; at the lower part is attached the other frame, by means of a couple of hinges, and rises at an angle of 44 degrees; two small slips of wood secure it in this position at the upper part of the first frame. This is covered with a well strained sheet of black or brown lace, easily procured at large stores in the city. It is mostly used by picture frame makers, and is three yards wide; being white it can be dyed to the requisite tint. For the Hillotype the lace would have remained white, and the local color given by a colored screen behind. The expense is trifling and the beautiful effects produced will I know amply repay the trouble of making. Several of them are in use, and can be seen at the rooms of the Photographic Institute on application to the President, Mr. Osborn, 156 Bowery.

I would also recommend through your politeness, to brother operators, who are at times troubled with *scum* on their plates, the free use of Nitric Ether, after the usual cleaning with rottenstone, etc. I have lately undertaken a series of experiments to ascertain the stock, breed and generation of that, at times, most troublesome visitant, and shall be happy to place my experience on the subject in your hands. It is, however, certain, that the Nitric Ether, if freely used, and well dried off, will obviate the difficulty.

I remain, dear sir, yours respectfully,

CHAS. DORATT,
Cor. Sec'y. Am. Pho. Inst.

We cheerfully give the above communication a place in our columns, and can recommend its adoption as an improvement to the picture. We have conversed with several Daguerreans who use it, and find that they all agree in its favor.

Doctor Dorat, the inventor, is one of our most scientific operators, and devotes a large portion of his time to experiments, the results of which he has promised to communicate to the Photographic-Art Journal.

We would also here state—as a most appropriate occasion—that Dr. Dorat is the Corresponding Secretary of the American Photographic Institute, an association of excellent organization, and which bids fair to become of great influence in the Photographic art. Dr. Dorat and Mr. Holt alternately deliver lectures on the practice and theory of the art, which lectures by the laws of the Institute, may be transmitted to its members in any part of the United States or Europe.

From La Lumiere.

HELIOGRAPHY IN NEW YORK.

Translated from the French, by C. Doratt.

THE art of Heliography has become a perfect "rage" in the United States. That nation among nations, full of youth, vigor, and ambition, has no intention of being secondary to the old world, in civilization and art. She loves novelty, and is surely not in the wrong. She is most eager in the race of great discoveries and useful inventions. There is therefore nothing strange in her passionate admiration of Photography. Of this decided love of art, I will relate an instance, to which I was lately a witness. An American, principal editor of one of the leading periodicals of Boston, being on a visit to Paris, to admire the wonders of our capital, before all other objects, desired to inspect the "Album" of the Heliographic Society, and I must say, "en passant," that he found the contents superior to anything of the kind he had seen in his own country. Yet the Art is progressing rapidly in the New World, and the number of its artists are daily increasing.

In the month of January appeared a Journal devoted to Photography, entitled the Photographic Art-Journal, as a monthly publication, which Journal has much success.

There are at present in New York 71 "ateliers" devoted exclusively to the Daguerrean Art, independant of the manufactories and stores, where are to be found the chemicals, plates, and apparatus of all descriptions required in the Art. To these "ateliers" are attached, including proprietor, operators, and those whom they employ, one hundred and twenty-seven men, eleven women, and forty-six children. The amount of rent paid by these artists is $25,550, or 137,970 francs. The average salary paid, at a moderate computation is $10 per week for men, amounting to $1,270,00, or 6,858 francs, being for the one hundred and twenty-seven operators, $66,040,00, or 357,616 francs per year. The salary of the eleven women, say $5,00 each, or 27 francs, amounting to $2,860,00, or 15,444 francs. The children, to the number of forty-six, at $1,00 a week each, $2,392,00, or 12,916 francs 50 cent per year. The annual sum therefore, necessary to cover these expenses, is $96,842,00, or 522,946 francs 50 sous.

In this amount we do not include the expense of material employed by the artists, as even an approximation cannot even be hazarded.

These details sufficiently show, that Photography has become an art of much importance in that city of commerce and industry.

We shall add a few remarks relative to the characteristic habits of American Photographers.

Their rooms are most elegantly furnished, perfect palaces, worthy of comparison with the enchanted dwellings of Eastern fabulous heroes. Marble, carved in columns, or animated by the chisel of the sculptor, sumptuous frames enclosing costly paintings; the feet press without noise the softest carpets; gilded cages with birds from every clime, warbling amidst exotics of the rarest kind, which diffuse their perfume and expand their flowers under the softened light of the sun. This is the American studio. The visitor under this charming influence forgets his cares, his features brighten and soon assume an expression of calm contentment The Merchant, the Physician, the Lawyer, and even the restless Politician, forget in this abode the turmoil of business. Surrounded thus, how is it possible to hesitate at the price of a portrait?

EARNEST LACAN.

From La Lumiere.

HELIOGRAPHIC SOCIETY OF FRANCE.

Translated from the French, (expressly for this Journal) by J. Russell Snelling.

MEETING OF FRIDAY, MAY 30, 1851.

M. J. Ziegler, President.

BEFORE the opening of the meeting, a series of magnificent portraits upon paper was examined, taken by M. Mestral, who designs them for the album of the Society. Three very fine proofs were likewise admired, which were presented by M. Lesecq for the same purpose; and finally M. Puech presented, on the part of M. Plau, a photographic artist of Paris, a portrait perfectly successful with an exposition of forty-eight seconds, at 4 o'clock, P. M., as well as a view of the quays, likewise obtained with remarkable clearness on glass, in four minutes, at 5 o'clock, P. M., with a simple French object-glass.

The President on behalf of the Society, tendered thanks to M.M. Mestral, Lesecq, and Plau, and pointed out at the same time, to the admiration of the members present, the rich collection of photographs of monumental inscriptions, and various sites, taken by M. Maxime du Camp, during his travels in Egypt and Syria. M. Du Camp promised to lay by some proofs of this remarkable collection, for embellishing the album of the Society.

The President then granted the floor to M. Secretan, who wished to give some instructions in relation to object-glasses, and the custom which it would frequently be convenient to adopt in their designation, in order more easily to compare them. This comparison is at all times easy with simple object-glasses, because then the *focal distance* of one being known, the size of one image of an object placed at a proper distance, is perfectly determined in the application which is made, and it is certain that another simple object-glass of like focus will give the same size of image of the same object; we will be able, consequently, to compare the clearness and intensity of the two images.

But for the systems with two glasses (and there may be from three to four and five glasses), amateurs, operators and opticians are uncertain as to what should be understood by focal distance. Almost all authors who have written on this subject, call *focal distance*, the distance of the last glass from the image. This is a fallacious definition, for it does not determine the size of the image; thus you might make an object-glass in such a manner as to have a very short focal distance, and which would give this same image very small.

We cannot compare two object-glasses, with double glasses, by saying that they have the same focal distance. It will be expedient, therefore, to designate these object-glasses by the size of the image of an object at a given distance, for example: suppose a set of object-glasses is double, triple, or simple, and which, placed at the distance of thirty-six inches from the object, (taking a unity,) gives an image which is the hundredth part of this object in size; then we can compare any two sets and say they are alike in that sense which admits of their giving an image of the same size of an object placed at an equal distance from both of them; or indeed, they may differ, because, placed at the same distance from the object, one gives an image which is the hundredth part of this object, while the other gives it the one hundred and twentieth part.

After having directed these remarks to be registered with the proceedings of the meeting, the President referred to the importance of definitely regulating the heliographic language. There are a multitude of expressions which are not understood. Favored with the explanations given by M. Secretan, the time without doubt is not far distant when opticians will come to a perfect understanding in relation to the names which should be applied to different object-glasses; but it will be well also to decide upon a number of other expressions, such for instance, as *photographist* and *photographer*, to which some give the same

signification, while others distinguish by the first name the artist who operates, under the pretext that by the second is designated (which is not the case) the instrument used in operating; and so with many other expressions, as *photochromy*, *heliochromy*, *chromotype*, *photographic*, *photogenic*, *photogene*, etc., adopted hitherto without sufficient justification for their use.

M. Buron then took the floor, and made some comments upon the remarks of M. Regnault, which were delivered at the preceding meeting.

He regretted that no motion had been made to name a committee for the examination of such object-glasses as had been debated at the said meeting; yet he had no objection, should some members wish to take upon themselves officially, the sole responsibility of trying the object glasses in question, and of making it the subject of a communication to the Society. M. Buron could, however, see even here a great inconvenience, because it is very difficult to assert that such or such optician makes better object-glasses than those of his brethren. The principal opticians of Paris are all qualified to make very good object-glasses, and it would be easy for him to show that it could be no evidence that one optician would constantly make better object-glasses than others.

M. Durien, who presided at the last meeting, explained the real object of the decision of the Society, taken upon that occasion by the unanimous vote of the members present.

The observations made by M. Regnault were quite in accordance with those of M. Buron.

Their object, in effect, was to render the Society irresponsible of any kind of decision taken either upon the instruments, or upon those who make them, and it was positively decided that if members should have anything to say to their colleagues respecting good object-glasses, which they shall have tried, shall communicate it to each other, and not make an official report.

M. Buron entered into some professional details upon object-glasses, considered in a theoretical and practical point of view; after which, the President, rapidly recapitulating the manifest wishes, with several reconsiderations, of the majority of the Society, earnestly appealed for progress upon this branch of manufacture, so important for the heliographic art.

We will apply our remarks to the venders of glass first, and then to the opticians. The venders of glass have the flint and crown glass very unequal; if the material is green or yellow, we may be sure beforehand that an object-glass made with this material will be bad. Good object-glasses when we place them upon a sheet of white paper appears perfectly white; object-glasses of a blue tint also give fine proofs, and without any decrease in the rapidity of the operation.

For astronomical purposes, the object-glasses must be a little colored; but for heliography, the whiter the glass is, the greater will be the rapidity of obtaining the proof. There is not more than one case in which the diminution of this whiteness may be advantageous; this is when it works in certain countries where the light of the sun is exceedingly active, as in Egypt or Italy. But we can increase or diminish the light of an object-glass as we wish. Yet in this case the clearest object-glass is the best. We therefore ask the manufacturers to make good and very white glass constantly, and we wish them, moreover, to direct their attention in always giving the flint the same composition, and finally to give opticians the means in their turn, of always obtaining identical results. There are variations which exist in the density and clearness of glass, which often establishes for each object-glass a certain value, independent of the work of the optician. For this reason, I have requested more than once that every object-glass ascertained to be good should be designated by a particular name; in this way, certain object-glasses which are as hidden gems, would be brought to light only by the works of those who possess them, and would become some day of very great value.

Well, how could this value be transmitted, either in a family, or in the photographic world, if these object-glasses did not bear an appellation. On the other hand, we have members who possess several object-glasses; some even having fourteen: by giving a name to each of them, it will be a good way to distinguish and compare them, either with each, or with others.

In this manner, all that is reported of an object-glass will be comprised in its designation.

Before the close of the discussion, M Bayard begged leave to offer some observations on the subject of colored glasses. He took occasion to make the following experiment, which perfectly corroborated the opinions advanced by the President upon this same question. M. Bayard took four object-glasses of the same diameter, every one of a different shade: the first was almost white, the second yellow, the third green, and the fourth slightly blue; he placed these object-glasses on a sheet of sensitive paper, and then exposed them to light for a very short time. Well, the white and the blue impressed the sensitive paper more than the two others: it is therefore certain, that the photogenic action is retarded by the yellow or green glass.

I will here relate, resumed the President, an experiment which was made in my presence at the College de France upon two object-glasses; one German, and the other made in France by a German; these object-glasses were of the same size, and the curvatures of one had been moulded upon those of the other. Nevertheless the first gave the image in eight seconds, and the other in sixteen. The difference was very remarkable, and the reason of it was not known. At my request these glasses were removed from their tubes, and then placed upon a sheet of white paper. The German object-glass, which gave the image in eight seconds, was perfectly white, but the French object-glass, which did not give it in less than double the time, was flint-glass, approaching a yellow color.

Every one may himself pursue like experiments, either upon the object-glasses he owns, or upon a collection of several other object-glasses, and if the experiment be several times repeated, we may ascertain to a certainty the influence which the different colorations of glass exert in the constitution of object-glasses: that would be a remarkable era in the progress of the art, and opticians would share in its advantages. The object-glass, next to the sun, is the principal instrument of the photographer; but we are aware, indeed, that much depends upon its being properly applied, and that quite a number of photographers have good object-glasses which they know not how to use.

M. Bayard said, in support of these last remarks, that independently of the good quality of the object-glass, it was of great importance to study the use of the diaphragm in obtaining images; some give particular attention to it and entertain a belief that the extent of opening more or less given to the diaphgram, considerably influences the success of an operation.

After some remarks from M. Buron, the President adjourned the meeting and invited the members present to visit a fine collection of proofs by M. Maxime du Camp.

This collection, of which we have already spoken, will be greatly valued by historians, antiquarians and geologists themselves. It is nothing more nor less than faithful drawings of monuments,—of remarkable sites; there is the monument, there is the sight itself as it is seen, as it is touched in its smallest details. All the ruins of ancient Egypt and Syria are there, such as the age and the men of the age left them. It would perhaps have been impossible for the most skillful pencil to copy them with that accuracy, which is hereafter to become indispensable to the kind of study to which such copies are applicable.

L. A. Martin.

CYANOGEN AND ITS COMPOUNDS.

CYANOGEN is a colorless gas formed by a union of carbon and nitrogen, possessing a pungent and peculiar odor, burns with a beautiful violet-colored flame, consuming twice its volume of oxygen during combustion, carbonic acid and nitrogen being disengaged. It does not support combustion. It combines with the metals and alkalies, its compounds being decomposed at a high temperature. It is rendered liquid by a pressure of four atmospheres at a temperature of forty-five degrees, but becomes again gaseous upon the removal of the pressure. Water absorbs four times and alcohol six times their volumes.

Cyanogen was discovered in 1813, by M. Gay Lussac—and for experimental purposes may be prepared by exposing to the action of the gentle heat of a spirit lamp in a small green-glass retort, or tube, the dry bicyanide of mercury, the gas being collected in the mercurial pneumatic trough. The vessel employed for the preparation of cyanogen should not be more than half full of the bicyanide ; nor should there be too much heat applied, for a decomposition of the cyanogen will take place with the extrication of nitrogen. Cyanogen united with metals forms cyanides and cyanurets.

Cyanic Acid.—Is a compound of cyanogen with oxygen, and is only found in the hydrated state, or united to one atom of water. It may be prepared by transmitting cyanogen through a solution of potassa, or any other alkali ; part of the water is decomposed, its hydrogen combining with a part of the cyanogen, forming hydrocyanic acid, whilst the oxygen unites with the remaining portion of the cyanogen and produces cyanic acid ; both of these compounds unite with the alkali in solution, and form salts, not very readily separated from each other.

Cyanic acid cannot be easily separated from any base with which it may be combined, in consequence of its disposition to be decomposed and converted into carbonic acid and ammonia.

Cyanates—are compounds formed by the union of cyanic acid with the bases. They are distinguished by evolving the odor of cyanic acid, accompanied by effervescence, when treated with dilute mineral acids, and by this solution, mixed with hydrate of lime, evolving ammonia. The alkaline cyanates are soluble, the others insoluble.

Cyanate of Ammonia—is formed by mixing dry ammonical gas with the vapors of hydrated cyanic acid which deposites a white, wooly, semi-crystalline mass. By heat, or exposure to the air, it is converted into urea.

Cyanate of Potassa—is made by roasting, at a red heat, dry ferrocyanide of potassium, in fine powder, upon an iron plate, constantly stirring, until it becomes fused into one mass, when it must be reduced to a fine powder, and digested in boiling alcohol, from which crystals of the cyanate will be deposited as the solution cools. A mixture of the ferrocyanide of potassium, with half its weight of peroxide of manganese, may also be used to produce this salt. The compound should be kindled by a red-hot body, and allowed to smoulder away, after which it may be treated with alcohol as before.

Cyanates of Silver, Gold, Lead, &c.—may be made by adding a solution of cyanate of potassa to another of a neutral salt of the base.

Hydrocyanic Acid.—This is commonly called Prussic acid, and is a compound of cyanogen with hydrogen. Several methods have been proposed for its manufacture, but Vanquelin is considered the best.

Take a tube eighteen inches long and half an inch in diameter, one end of which is drawn out and bent at right angles, to which is attached a small flask or bottle, to be kept extremely cold either with ice or some freezing mixture, and introduce into it a quantity of bicyanide of mercury coarsely powdered ; a few pieces of carbonate of lead may be previously introduced, and after the bicyanide has been put into the tube, a few fragments of the dry chloride of calcium may be with advantage put in also. Into the open ex-

tremity must be introduced a bent tube attached to a bottle or flask, containing ingredients for the extrication of sulphuretted hydrogen gas. When the joints of the connecting tubes, bottles, &c., are well luted and otherwise secured, the gas may be allowed to come in contact with the bicyanide of mercury; this will in a few minutes become black, the change which takes place being the sulphur of the sulphuretted hydrogen uniting with the mercury, forms the bisulphuret of mercury, and liberates cyanogen, which immediately combines with the hydrogen set free from the gas and forms the hydrocyanic acid. The gas bottle is now separated from the tube, and the extremity of the latter securely closed, the flame of a spirit lamp being passed along the under part of the tube, until the acid is made to pass into the cold receiver, where the vapor frequently condenses into a solid form.

This acid should be very cautiously experimented with as it is a most virulent poison and is apt to produce dangerous consequences, a single drop being sufficient to produce death, and the vapor is nearly as injurious to life. It has a strong and penetrating odor, resembling that of bitter almonds or peach blossoms. It soon suffers decomposition, evaporates rapidly, has a very slight affinity for alkalies, combines readily with water and alcohol, and in every proportion its vapor detonates with oxygen, forming carbonic acid and nitrogen.

The presence of hydrocyanic acid may be detected by nitrate of silver, which is precipitated in the form of a white curdy precipitate. This test is not, however, always to be relied upon; but the sulphate of copper is a very delicate test, rendering water, which contains only the twenty-thousandth part of the acid, quite milky; the cyanuret of copper thus formed being of a white color.

Cyanide, or Cyanuret.—This is a compound of cyanogen and a metal.

Cyanide of Gold.—This is principally used as a medicine in scrofula and similar affections, and is made by adding pure cyanide of potassium to a solution of gold in aqua regia, carefully deprived of all excess of acid by evaporation; collect the yellow precipitate: or you may add a boiling solution of twenty-four parts of bicyanide of mercury to another of sixteen parts of gold, dissolved in aqua regia; evaporate to dryness, and wash with pure water.

Cyanide of Mercury.—Prepare by saturating dilute hydrocyanic acid with binoxide of mercury; evaporate and crystalize. This compound should be transparent and totally soluble in water. This solution, on the addition of muriatic acid, evolves hydrocyanic acid, known by its smell, and a glass moistened with a solution of nitrate of silver, held over it, gives a deposit soluble in nitric acid.

Cyanide of Potassium.—This compound is extensively used in the Photographic art, in the process of galvanizing, or silvering plates,—the method of performing which we gave in a former number. Several methods are employed for its manufacture. You may treat a saturated alcoholic solution of pure potassa, with the vapors of hydrocyanic acid, as long as it throws down a white crystalline precipitate, which must be collected and washed with alcohol; or you may add hydrocyanic acid in excess to a concentrated solution of pure potassa and evaporate until crystallization commences, then pour it into a porcelain vessel and fuse at a red heat.

When pure, this salt is colorless and odorless; when exposed to the atmosphere moisture is absorbed, and it acquires the smell of hydrocyanic acid. If it effervesces with acids, it contains carbonate of potassa, and if it be yellow it contains iron.

Cyanide of Silver—is prepared by adding dilute hydrocyanic acid to a solution of nitrate of silver, as long as a precipitate falls down; then wash and dry. Cyanide of silver is white, soluble in ammonia, and decomposed by contact with neutral vegetable substances. By exposure to light it turns violet-colored. It is used as a medicine.

Cyanide of Zinc.—Dissolve metallic zinc in hot acetic acid, and add hydrocyanic acid as long as a precipitate falls.

Cyanide of Iron.—This is sometimes called ferrocyanic acid, and may be obtained by adding to the ferrocyanate of potash in solution, a solution of hydrosulphuret of barytes, as long as any precipitate takes place; it is then filtered, and the precipitate being washed and dissolved in a quantity of water, is to be decomposed by sulphuric acid, taking care not to add it in excess; a

sulphate of baryta will be precipitated and the acid obtained in solution. By allowing the solution to evaporate spontaneously, the ferocyanic acid may be procured in yellow colored crystals of a cubic form.

Cyanide of Chlorine.—This compound is prepared by passing chlorine through diluted hydrocyanic acid until it acquires the property of bleaching. One part of the chlorine combines with the hydrogen of the acid and forms muriatic acid, and the other part attaches itself to the cyanogen to form the cyanide of chlorine. Any excess of chlorine may be removed by agitating the mixture with mercury. Cyanide of chlorine has a very pungent and irritating smell, is soluble in a solution of the alkalies, alcohol, and water. When cooled by a freezing mixture it liquifies at 10° and freezes at zero.

Cyanuric Acid.—This is a product of the decomposition of the soluble cyanates by dilute acid, of urea by heat, &c. It is a peculiar acid, and was discovered by Scheele. It is prepared by heating urea until it fuses, and is converted into a white or greyish whiteness: Dissolve this in strong oil of vitriol, and add nitric acid, drop by drop, to the solution until it becomes colorless; then mix the liquid with an equal volume of water. On cooling, crystals of cyanic acid will be deposited, which must be washed with a little cold water, and then dissolved in 24 parts boiling water, when crystals of the hydrated acid will form as the solution cools. By exposure to the atmosphere or a gentle heat, they lose their water and fall into powder.

Sulphocyanic Acid.—Expose to a strong heat, (not to redness) over a charcoal furnace, a mixture of equal weight of ferrocyanate of potash and sulphur; the mixture soon melts and takes fire and must be withdrawn from the fire after the combustion ceases. The residuum, which consists of sulphur, sulphocyanuret of potassium and sulphuret of iron, must be digested in water, a portion of which is decomposed by the potassium; its oxygen combining with it forms potassa, and the hydrogen goes to the sulphocyanogen, and the sulphur and sulpheret of iron remain mixed with it in an undisturbed state. The sulphocyanate of potassa is then poured into a retort, and sulphuric acid added; the acid combines with the potash, and sets free the sulphocyanic acid, which must be separated by distillation.

A TREATISE ON PAPER PHOTOGRAPHS.*

BY M. BLANQUART EVRARD.

Translated from the French, by J. R. Snelling, M. D.

WE have shown in the preceding chapters the particular properties of four preparations rendered sensitive by their combination with the aceto nitrate of silver.

We are not obliged, therefore, in this place to discuss the choice of models, nor the time of exposition, but only the general dispositions of the operations relating to the optical instrument, which we require for our photogenic image.

Sensitive papers placed in the holders, are, as remarked, shut between two glasses.

The first care to be taken, is to dry perfectly the surface of the glass which is to be presented to the light at the interior of the camera-obscura, since the purer it is, the better will it permit the passage of luminous rays which should traverse it, in order to exert their action upon the photogenic coating.

Care must also be taken that the object-glasses are rendered clear and dry by means of a very soft buckskin.

While the camera-obscura remains shut, if it were conveyed into another atmosphere, or exposed to the rays of the sun, it would be rare that the inside would not be filled with vapors; in this state, it would be impossible to obtain an image on the sensitive coating, for the luminous rays would be arrested by the bed of vapors condensed upon the object-glass. It is then indispensable, before proceeding with the exposition to place the inside of the box in communication with the air in which we operate, by raising some time beforehand the holder which is furnished with ground glass and which serves for closing it; and if the operation must take place in the sun, its rays should be made to enter the box for several minutes. The operator to be certain of success, must be acquainted with the instrument which he employs; we have already stated what course it was necessary to pursue to avoid disfiguring the image.

By removing the model to be reproduced to a sufficient distance we can acquire a very great accuracy, and generally correct the too exaggerated effect of linear perspective. The largest instrument possible should therefore be used, and the image reduced to the smallest size which we are able to give it.

Photographers who have made the portrait their study, as amateurs, who have sought particularly this result, direct their attention more to the accelleration of the operation than to the beauty of the result in relation to truth and precision of design.† Fortunately, our more skillful constructors have not been obliged to sacrifice a moment in perfecting their apparatus; they have not underrated the present for the prejudice consequent upon the future. This is a wise and happy thought, because the almost instantaneous formation of the photogenic image by the instruments distributing the light very uniformly over the whole surface of the picture renders failure almost impossible, for if it is not produced at the moment first marked out, it probably may be the next day. We have not then to occupy ourselves with the different classes of instruments, but we may consider the operator possesses a perfect instrument.

In certain conditions of the camera the image may be made defective by imperfectly placing the focus — that is to say in placing the impressionable surface intended to receive the luminous rays out of the same plane occupied by the ground glass upon which the image has been previously viewed—or by a disagreement between the

† This remark will apply equally well to the Daguerreans of this country, and the idea so entertained is a great bar to the production of good pictures.—*Ed. Phot. Art-Jour.*

visual and the chemical focus—or, in other words, where the focus on the ground glass will not be in the same plane with the point where the photogenic rays, which alone must form the image, meet; a condition which, according to the learned remark of M. Claudet, shows the imperfect construction of the object-glass.

It is necessary then, before using a new instrument, to adopt the method which this talented operator has given, to assure ourselves whether the apparent focus perfectly coincides with the optical focus. By grouping four or five objects before the camera, placing in the centre those which should be represented with most clearness, the real point of the chemical focus will be shown; the operator will then know upon what plane to view the object in order to obtain the result which he desires.

DEVELOPING THE IMAGE BY GALLIC ACID.

Make a saturated solution of gallic acid in a decanter of distilled water, and let there be an excess of gallic acid in the decanter.

Filter into another decanter the required quantity, at the moment of using it, and if an excess of the solution remain after operating, pour it back into the first decanter.

The filtration has the effect of separating the crystals should there be any undissolved, or the kind of funguss which is formed in the solution when it has been some time prepared.

Although the image may be formed, it is not apparent when withdrawn from the camera-obscura. To render it visible the paper must be submitted to the gallic acid.

Here is the manner in which we proceed in this operation. We pour into a basin large enough to receive the proof, a portion of the filtered solution of gallic acid into which we plunge the paper, and apply it over the whole surface of the paper by briskly shaking the basin. The image soon appears; we continue to agitate the basin, to equalize the action, and to prevent it from concentrating at some parts to the exclusion of others.

It is of the highest importance to render the action of the gallic acid immediate and uniform over the surface of the paper, for if from the first application, this uniformity were not established, it would be impossible to remedy any defect, and the proof would be without harmony. For a negative proof to have every requisite quality it is necessary that the image should be produced not only at the surface of the paper, but even in the body of the paper itself, consequently the action of the reagents must permeate through its whole thickness. Moreover, in order to know when the action of the gallic acid has been sufficiently prolonged, we must not limit ourselves merely to an examination of the surface, but the proof must be viewed by holding it up to the light and the action arrested when we are confident that the gallic acid has been thoroughly absorbed by the paper.

Negatives which appear dark at the surface and in which the image is well marked, would only admit of an indifferent positive proof, while another negative proof of a clear grey appearance, would produce excellent positive proofs.

This difference is owing, in the first case, to the fact, that the gallic acid has acted merely at the surface of the paper with great energy, while in the second instance, although more moderate at the surface, the action penetrates through the whole of its thickness.

The examination of the negative proof by holding it up to the light, is therefore absolutely necessary. Excepting when we operate upon albuminized paper, it is always prudent to be upon our guard against the danger of prolonging too much the action of the gallic acid, for, without this precaution, the details, and the shaded parts, have neither proper light or tone, and have not the clearness which imparts a charm to the proofs.

The light parts of the model are dark in the negative proofs, and when these darks are too powerful, the positive proofs are unharmonious, and there is an exaggeration in the effects of light.

By proceeding with circumspection, we avoid all these inconveniences, and if the proof happens to be deficient in design in the shades or of brilliancy in the lights, notwithstanding their circumspection, it is an accident which is not irreparable, and which we can remedy by the means we shall hereafter describe.

With negative proofs slightly marked, we may obtain positive proofs, perfect in clearness and finish, which is impossible in cases where the negative proof is too powerful.

Papers prepared with the gallic acid solution, acquire a lively coloration. The image appears almost immediately.

It is of the highest importance to watch over this part of the operation with the greatest care.

Papers prepared with serum are more resisting to the action of light in the camera-obscura and of the gallic acid; they often require, therefore, infinitely more time, to perfect the details in the shaded masses. It must not be supposed, when we employ this preparation, that the action of the gallic acid is prolonged. The extreme limit of this action, is the moment when the details of the light parts commence to be effaced and the outlines loose their clearness.

We have already partially explained the changes which the albuminized papers undergo during their exposition in the camera obscura. Under the influence of gallic acid, the image shows itself successfully in every part; it becomes thus gradually developed owing to the coating of albumen being impregnated more and more deeply—even into the body of the paper itself. A little practice will be requisite to enable the operator to profit by all the points which present themselves in this preparation, the richest and the most complete of those upon paper, since it affords at once the most exquisite proofs, with the softest, the most charming, and also the most powerful effects.

The preparation with bromide of iodine acts with gallic acid nearly in the same manner as that of serum, but this preparation is only introduced here as a resource and an expedient, when we have no other means at our disposal, for it developes the image slowly and rarely admits of the qualities which characterize a perfect proof.

One of the great difficulties of photography arises from the spots which form upon the back of negative proofs.

In the formation of the image upon the positive proof, we know that the positive proof is traversed by light, the dark parts of the negative proof presenting an obstacle to the light by reason of their intensity, and the positive design thus becomes the reproduction of the negative design, with the order of lights inverted. This design is pure if the negative proof is nothing more than the image formed in the camera-obscura, but if the back of the proof is spotted, the spots afford an obstacle to light; they constitute as it were, a second design in addition to the first, and consequently the positive proof thus reproducing them is rendered more or less defective.

These spots upon the back of negative proofs being produced more frequently during the action of the gallic acid; we generally attributed them to this agent, and all operators have multiplied the precautions for avoiding them. We directed, for instance, to guard the back of the paper from contact with gallic acid. Now, this is an error; the gallic acid is not the cause of the spots.

When we apply gallic acid on the surface of paper, instead of plunging the entire paper in the bath, spots are produced, as well as when the solution touches the back of the proof only.

This effect is easy to comprehend. The back of the paper always contains a certain quantity of nitrate of silver, precipitated and not reduced by light, and when the solution of gallic acid moistens it, a gallate of silver is formed which is incrusted in the paper and makes the spots the more intense according as the quantity of the salts of silver is greater.

After having ascertained that the cause of the spots originated wholly in the presence of a certain quantity of the silver salt upon the back of the proof we have advised plunging the proof in a bath of gallic acid, instead of restricting its action to the face alone. By this simple modification in the process, we avoid spots, for by attracting into the bath the salt of silver from the back of the proof, the cause which produces them is counteracted. The salts of silver dissolved by the bath, are in too small quantity to act as a dye upon the paper. The action of the bath is confined to the reduction of the salts which produce the image. This action may be prolonged until the gallic acid wholly produces its effect, without coloring the paper. We can therefore by this means give the proof all desirable vigor without spotting it.

It is for a similar reason that we can secure powerful effects, notwithstanding a short exposition in the camera-obscura.

MEANS FOR FIXING THE NEGATIVE PROOF.

As soon as the negative proof reaches the point when it is necessary to take away

the action of the gallic acid, we wash it freely with water and plunge it into a solution of bromide of potassium.

Bromide of potassium dissolves salts of silver which have not been impressed by light and which would form a dark mass under which the design would inevitably disappear, if the proof were exposed to light, upon withdrawing it from the bath.

Bromide of potassium may be employed in solution more or less concentrated. However, it is more convenient to have recourse to a solution in which the degree of concentration is invariable.

That which we make use of, is thus composed:

Bromide potassium	30 gr.
Distilled water	100.

With this solution, a minute or two is sufficient for all the salt which still remains in the paper to be absorbed and dissolved.

After this immersion the proof must be removed from the action of the bromide—which would too much weaken the tones of the image,—and cleansed from that salt by several washings with ordinary water before drying with blotting paper.

The use of a more diluted solution of bromide would not prevent the corrosive action of this salt upon the design, and would oblige us to farther prolong the immersion in the bath, and to use a greater quantity of liquid, since it is necessary that the bromide dissolves, in one way or another, all the salt of silver.

Chloride of sodium (common salt) may replace the bromide. It is less expensive, and frequently more convenient in traveling, as it can be found everywhere. It must be used in saturated solution and the proof suffered to remain in it several hours. This reagent does not present the same dangers as the bromide; its action is slower, but we have no fear, as with that, of the discoloration of the proof.

But of all reagents to which we can have recourse, the hyposulphite of soda is the most suitable. Its action upon the negative proof is double; not only does it seize upon the salt of silver which is in solution in the paper, but also that which the light has gradually reduced, and which colors the ground of the proof.

With hyposulphite the paper becomes white; with the bromide of potassium and chloride of sodium it preserves a yellow tint.

For the ground of the proof to be decolorized, and that the paper may recover all its whiteness, the proof must remain in the bath at least one or two hours.

Nevertheless, we ought not to give the preference to the hyposulphite over the other reagents, unless we are able to oversee its employment. Without this inspection we are liable to loose the proof, because the solvent action of the hyposulphite extends to the more colored parts of the proof, and would, if too much prolonged, destroy all harmony.

It is somewhat important to use the hyposulphite in solution more or less concentrated, since we can equalize its action upon the proof and arrest it when we wish.

It is sufficient for this purpose, to view the proof from time to time by holding it to the light. The action is finished when the whites of the image have totally lost the deep yellow which they previously had.

The hyposulphite should always be used cold. When warm the solution acts with extreme energy, attacking the darks as well as the whites, and it is rare that a proof preserves the harmony which it merits, when it has been submitted to this treatment.

But that which is dangerous for good proofs may become an assistance in improving proofs which would be defective; thus when a proof is spoiled, whether the exposition in the camera-obscura has been too much prolonged, or the gallic acid has acted with too much energy, we can still render it transparent, by submitting it to the solvent action of the hyposulphite; however, it is not essential to enlarge in a general manner upon the efficacy of this method.

We have hitherto spoken of the hyposulphite employed alone, and the manner it is commonly made use of. We come now to describe a particular and very valuable property which it is possible to impart to it. By pouring into the solution of hyposulphite several drops of acetic acid, and maintaining the bath in the acid state (as for litmus paper) the dark parts of the proof are not attacked, and the demi-tints acquire more brilliancy and are better brought out.

When acetic acid has been added to the

hyposulphite, we may let it remain a whole day in the bath without inconvenience.

In Daguerrean excursions, the operator has not time to devote whole hours to the execution of proofs. The most expeditious and least complicated means are the best. In this instance, we advise the solution of marine salt. After having dissolved the greatest part of the silver, by means of this salt, we wash the proof, screen it from light, and submit it upon returning from the excursion, to the solution of hyposulphite with the addition of acetic acid.

It is somewhat important to prepare negative proofs by all the processes without distinction. The process, we have described, should be varied according to the effect desired. So also the use of the hyposulphite bath is not always advantageous. It is, therefore, necessary to know in what instance it should be employed, or preferred to the bromide of potassium or chloride of sodium. By more completely dissolving the salt of silver, which produces a yellow tint, the hyposulphite imparts greater transparence and clearness to the demi-tints, but it likewise weakens them, and it often happens at the final result that the design is scarcely revealed in the positive proof.

If we have a negative proof in which the light parts of the picture are strongly displayed, with the demi-tints and dark parts almost unbounded, the want of harmony which produces these contrasting effects, is exaggerated by using the hyposulphite, which scarcely acts upon the light parts, and effaces or much weakens the demi-tints, so that the final results of the proof, which was indifferent, still farther looses its good qualities, and becomes entirely spoiled.

When we withdraw the negative proof from the bath of bromide, of common salt, or of hyposulphite, we ought to wash it freely with water and then place it in a large vessel filled with water which we renew several times, in order to perfectly free the paper from the salts which it might contain. We may let the proof remain twenty-four hours in the bath. This treatment of the proof therefore accomplishes the most essential desideratum. There is nothing more to be done than to dry it, by placing it successively between several folds of blotting paper until it becomes perfectly dry.

Unless the negative proof is extremely feeble, it must be waxed before using it for the reproduction of the positive proofs. The wax renders the paper more transparent and adds much to the clearness of the tints, and the general harmony is better. It has, moreover, the advantage of equalizing the grain of the paper by closing the pores; it also gives a firmer consistence. A positive proof obtained from a negative which has not been waxed presents a very rough grain, the demi-tints are less established and the whites more dry.

Negative proofs which have been waxed keep better, and are less exposed to external accidents; they acquire mixture with difficulty, while proofs which have not been waxed readily alter. So that a negative proof which has not been waxed almost always spots, and consequently the positive proofs taken from it are rendered equally objectionable, whereas if it had been waxed, no alteration would take place.

The negative proof must not be waxed unless it is perfectly dry. We then, to effect this operation, place the negative on a sheet of white paper after sprinkling the back of the proof with white wax (virgin wax) rasped; then place a second sheet of paper upon the first, and finally melt the wax by means of a hot iron. We should always be sure that the iron is at the proper temperature; should the wax become yellow, it would be necessary to cool it, or lay several sheets of paper upon the proof, in order to diminish the intensity of the heat.

When the wax is melted and the proof well imbued, it must be freed from the excess of wax which it contains by continuing the action of heat as described, renewing the sheets of paper in proportion as the wax of the proof penetrates them and becomes extended.

Before finishing this operation, we should ascertain, by observing its transparence, that the wax has penetrated it very uniformly. If it be otherwise, it will be necessary to recommence the waxing as for fresh proof.

CHAPTER VI.

DRY PAPERS.

One condition of success, is to use the papers a short time after their preparation, after a length of time they change and

grow dark, and the results become more and more uncertain.

We avoid all these accidents, by having recourse to serum of milk, or bromide of iodine.

Whatever may be the action of these bodies, of which in the present state of the science we are ignorant, it is certain that they prevent the alteration of the papers and are of the greatest assistance in photography.

PREPARATION OF DRY PAPER WITH SERUM.

The preparation of paper with serum was described in Chapter IV. To use it in the dry state, it must, after being submitted to the aceto-nitrate, be dried between two sheets of blotting paper, and another sheet of lining paper laid outside which should be perfectly dry, and then placed between two glasses in the holder of the camera-obscura.

The sheet thus pressed between two glasses, insures a very even surface, and preserves its photogenic properties unchanged. In winter, the thick paper preserves its photogenic qualities several days. But, in summer the paper should be extremely thick to remain good 24 hours.

Very fine paper would perhaps not keep an hour at this high temperature, while it is easily preserved a day at zero.

It is therefore important to avoid passing the paper to the aceto nitrate except at the moment of using.

The dry paper is less sensitive than the wet paper, and it is necessary to expose it three times as long in the camera-obscura.

Dry papers must be rejected, when we wish to obtain proofs promptly. For inanimate objects, such as monuments, in which the time of exposition may be prolonged with impunity, dry papers are more suitable, and when they are very thick, the proofs are finer and more delicate, and the gradation of light more perfect.

PREPARATION OF THE DRY ALBUMINOUS PAPERS.

Albuminous papers, as described in Chapter IV. may be employed in the dry state. We proceed with them in the same manner as with the papers with serum. They are more changeable than papers with serum. We think that excellent papers might be obtained by submitting them to the serum before albumenizing.

DRY PAPERS WITH BROMIDE OF IODINE.

The preparation of dry papers with bromide of iodine was described in Chap. IV. It is submitted to the aceto-nitrate and then dried with blotting paper. As we had occasion to say in relation to the papers with serum, they may admit of a proof in the dry state, if the exposition takes place on the day of their preparation.

We obtain the best result by proceeding in the following manner:—Pour into a basin a solution of

1 part nitrate of silver;
30 parts distilled water.

Lay the paper upon the surface of the liquid.

Care must be taken that there are no air bubbles between the liquid mass and the paper; leave the paper a minute upon the bath, then withdraw it and drain it by hanging it up by one of the corners; lay it afterwards on a very clean impermeable surface, on a sheet of glass, a marble table, a varnished piece of furniture or an oil cloth. Let it dry slowly, in order to avoid the collection of the liquid in separate masses, which produces spots on the proofs.

If we experience any difficulty in operating in this manner, we can dry the paper between several sheets of blotting paper.

In another vessel containing a solution of,

25 parts iodide potassium,
1 part bromide potassium,
560 distilled water,

Plunge the entire paper for a minute and a half, or two minutes if the paper is very thick, leaving the nitrate side up; withdraw it from this bath, taking it by the two corners, and pass it without letting go the hold to a larger vessel filled with distilled water, in order to wash it and remove all deposit of salt, which might, without this, remain upon the surface; then hang it with a white thread to a cord, which is placed horizontally; fasten it with pins by one or two corners, close it afterwards in a pasteboard box, where it is screened from light, and without piling it up. If we keep this paper from moisture, it is excellent for use, several years after its preparation.

If spots should form when we submit the paper to the iodide bath, it will be prudent

to keep the spotted sheets separate, for the spots would be communicated to sheets with which they might come in contact.

When we wish to prepare the papers dry for operation, we submit it to the bath of bromide of iodide described in Chapter IV. When the paper is dry, we form a mixture of equal parts of aceto-nitrate of silver and a saturated solution of gallic acid. We make, with cotton wadding, a very soft pad, which we renew at each operation; we slightly imbue it with this fresh solution, and gently apply it upon the surface of the paper. To obtain good results, the paper must be furnished with the quantity of gallo-nitrate of silver, which is absolutely necessary to change it from the violet tint, which it first had, to the pure white, which it acquires under the influence of the new preparation.

Independently of this precaution, it is also necessary to afterwards dry the paper thus whitened between several sheets of blotting paper ; we finally place it upon a bed of lining paper, likewise dry, between the two glasses in the holder of the camera-obscura.

Paper thus prepared keeps like that with serum. In winter, paper prepared in the day-time remains good until the next day.

These three kinds of papers, which we may use dry, are not equally suitable for all objects : we obtain powerful shades with the serum papers ; a great mildness and much softness, with that of albumen ; a uniform and less powerful effect with bromide of iodine.

DEVELOPMENT OF THE IMAGE UPON DRY PAPER.

The course to pursue in this operation essentially differs from that directed for wet papers. While the back of the wet papers is preserved from all kinds of spots by immersing the proof in the gallic-acid bath, dry papers have their backs deeply stained by the acid itself.

It is necessary to avoid with the greatest care wetting the back of the paper with the gallic-acid. Besides, nothing is easier ; and for this purpose, we pour a little gallic-acid dissolved in water, upon a very even glass, which projects from the support upon which it lies, and which must be less than a half centimetre high, and not so broad as the impressible paper which is placed upon its surface.

By raising the paper, and viewing its transparency from time to time by the light of a candle, we perceive the development of the image, and remove it from the action of gallic-acid when it wholly acquires the vigor and clearness which is desirable. We proceed in the same manner for papers with serum and albumen. For papers with bromide of iodine we bring out the proof by rubbing it with the mixture of aceto-nitrate and gallic-acid, in the same manner as when it is exposed to the camera-obscura. It is actually the same operation repeated a second time.

It will be advisable not to make the mixture of aceto-nitrate and gallic acid except at the moment of using, for this preparation becomes colored in a few minutes, and consequently the result is defective.

The addition of nitrate of silver to the gallic-acid solution is useless, when we use papers with bromide of iodine, except for obtaining a more energetic effect, for by prolonging the time of exposition, the gallic-acid answers perfectly.

When the gallic acid has fully produced its action, and when the proof has acquired all the power desirable, we wash it freely with water, and fix it with bromide of potassium, or hyposulphite, as remarked in Chapter V., for proofs obtained by the wet method.

To be continued.

DEVELOPMENT OF NATIONALITY IN AMERICAN ART.

DISTINCTIVE character in our literature and art has been, to European critics, the subject of comment—pleasant and sarcastic—narrow and absurd; or, though more rarely, hopeful and prophetic. To the philosopher it is no puzzle. A national literature or art can only be the production of a marked, pervading trait of national character. When the American mind shall be fully developed, it will express itself in unmistakable characters. Nations, like individuals toil in the morning, and when the heat of the day is past, comes the repose and the festivity—the garlanding and the gathering round to honor and listen to the aged. Hitherto it has been our toil in the hard race for superiority, with nations older and wiser than we; and now, when our ships plough the seas, unrivalled; when our mechanics, our seamen, our agriculturists, have the rank they have struggled for, we can rest and breath, and lighten the dulness of mere utility with poetry and song. One of the beautiful truths which Ruskin has thrown every where through his writings, is, that "we have to consider that the cornice as the close of the wall's life is of all features that which is best fitted for honor and ornament." So of the national edifice. Its foundations were laid in the morning twilight, with a thousand fears and anxities, laid in the best blood and treasure of its builders. Its walls were built with the earnest haste of men who build to shelter themselves from the storm. What time was there to be happy in all this? But now, when the builders have reached the cornice—the crowning glory of the work—is the requirement made to the charms of the artistic ornament. It is our present object to point out, as far as we may, the character of ornament which shall best comport with that of the edifice and how to attain it most directly. This is represented by the term, Nationality, or a "School."

That there exist the elements of distinctive greatness in the study of Art, is proved by many indications some of which we shall here adduce, less to prove what we doubt, than to point out in which direction we ought to look for that light whose rising we all hope for. For these, we must study the indications of taste in those manufactures more or less remotely allied to the fine arts, being assured that if taste does appear in the former, it will be shown proportionably in the latter. The most valuable indications will, of course, be found in those branches in which the artist and the artisan are combined, as preëminently in ship-building It is a generally acknowledged fact, that in beauty of form, the American ships are the first in the world. This is more easy demonstrable, as the laws of structural beauty are dependent on a demand for a fitness to the use designed, as well as on abstract beauty of form. Thus, in the much debated question of the superiority, in this respect, of the Asia and Atlantic, there are three rules applicable, viz: 1st. That in abstract lines, those are the most beautiful which approach nearest to the right line, still maintaining distinctly the character of the curve, or in technical phrase, the chastest. 2d. That right lines and angles indicate strength, and curved lines grace. 3d. That simplicity is an important component of beauty. The Atlantic's hull is built in accordance with all of these laws. The straight stern, delicate curvature of her lines, and exceeding simplicity, giving all the indications of strength, grace, and neatness.* I dwell on this point, 1st, because I wish to make it understood, that this *is* an index of the feeling of the nation; and this, because the development of these statements of beauty was instinctive, and because they are paralleled by our manufactures; and, 2d, *because the popular appreciation of them is so strong and universal;* and, 3d, because having proved that this feeling does exist in the national character, we have proved that there exists the most im-

* If the reader has Ruskin's "Stones of Venice," he will find in a plate (VII) of the most beautiful natural lines, a very close approximation in the Atlantic's water-line, to the inner curve of the alisma plantago leaf.

portant component of the artist mind ; that which gave Raphael his grace, and Fra Angelico his purity, viz. : feeling for abstract beauty of form, alike in the hull of a ship and the human or other natural form. Of the cause of this development we may speak some other time ; it is sufficient for the present to show that there is such a *taste :* and it is but to be directed into the proper channels to produce the results we hope for. There is no such thing as bad taste ; there may be undeveloped or rude taste, but we speak incorrectly when we speak of it as bad. If taste be, as it is defined, the power of receiving pleasure from external objects, it will be at once seen, that though the human mind may take a greater pleasure in that in which beauty is partially developed, than in the perfections of nature, we cannot call that bad or false taste which does not take pleasure in objects *according to their ugliness.* But there is no mind so constructed. Is not this evident? Then is it equally evident that where there is a preference, it lacks but cultivation to direct aright and produce a taste, more or less refined, according to the native capacity and purity of the mind.

Having proved the existence of taste, we have inferred that of talent : the former is the forerunner of the latter.

Let us examine, before we go further, into the desirability of this quality which we have called Nationality. We have defined it as the attainment to a School, or a distinctive manner of thinking upon, or regarding the subjects of art, corresponding to some trait of the national mind, it is desirable then :

1st. Because it is necessary to a popular appreciation of, and sympathy with Art, without which, its great function—its humanizing and refining influence—is lost in a measure. Not that the artist must aim only to reach the multitude ; but he should especially address himself to the expression of those feelings which he possesses in common with them. Let him be the leader of the taste of a nation, if he will, but to be so, he must lead where they can see, so far as they can see at all, that they are right, and thus winning their confidence, he will keep their reverence wherever he may wander. It is said that the many are always wrong, and so far as the determining the comparative merits of painters, or of truths, it is true ; but true only, because they set no value on the things they do not comprehend. So far as they go they are right: the instincts of mankind are more to be relied on than the finespun theories of the schools, especially in such a country as this, where education and free thought are universal. The Greeks were accustomed to expose their works to the criticisms of the populace. *They* wrought out that nationality, and the people became a nation of art-lovers. That artist who has enlisted the enthusiasm of the people, has established his rank beyond all influence of critics. This enthusiasm, then, increases both public taste and artistic influence.

2d. It becomes a record of the progress of humanity and the race. Thus are marked indelibly the characteristics of the world, age by age ; and we read on that mighty page, the progress of civilization —the movings of the spirit that animated the nations in the course of empire. The reader will find this point treated of in Ruskin's pamphlet on Pre-Raphaelitism, and Emerson's essay on Art. But Emerson is wrong in that he makes this the great mission of Art. The wave that rolls up the ocean sands stops not to ask where the last one stayed, and so will neither our age check its course, or guide it even by the tide-marks of a former. But, though we may not be guided by the experience of the past, we shall delight to read its lessons ; and so will the future con ours, and hope in progress Nor is the historian to destroy the artist. The charms of Art are but the adornment of the casket in which great truths should be contained. Artists should not, amber-like, gather their worth around straws.

3d. It is desirable as giving expression to the aspirations and sympathies of a nation ; to social and political wrongs and errors, possessing a power of expression far beyond that of words. To this end its application must be pointed, and in terms of distinct national character.

More need not be said upon its desirability, but it will be seen that it does not consist in the establishing of academies or of new rules and canons, nor in new systems of color or light and shade, but in the expression of new thoughts, of which these

are but the characters of expression. These new thoughts must be perceptive of the distinctive features of the natural character; of those traits in which we differ from any or all other nations, yet not neglecting those which we hold in common with the age or mankind; in the delineation of the modifications of class (not of *artificial* rank); in the fiery democratic impulses of the masses; the calmer elevation of the statesman; the purified feelings of domestic life; all the outbursts and aspirations, the energy and fiery enthusiasm which belong to the nation. These mark what our school must be, and to the study and development of them the artist must give his heart and intellect, who would assist to form such school, or who would not be forgotten in future years. It will readily be suggested that these conditions require the employment of such subject as will call out the traits alluded to, either by being direct statements of them, and thus exciting recognition, as the admirable piece of German character in the Dusseldorf gallery—the Harvesters returning home; or giving such subjects as will call them out, scenes from history, stimulating patriotism, &c. Thus it may be seen that painting of history is valuable, mainly for the opportunity it gives of expressing the national character under the circumstances chosen for delineation, or biographically, by giving the character of the great actors, as with Delaroche; and for expressing those facts belonging particularly to that time, which might be lost. And so history painting becomes more valuable as it dates nearer the actual time of the event, and according to the artists ability to enter into the spirit of that time.

If we study European schools we shall find the state of Art exactly expressing the moral and intellectual state of the nations. In France intellect and enthusiasm are not more remarkable than the strong sensual feeling and an utter want of reference for things human and divine. In their art we find great grasp of science corresponding to intellect—great power and energy, to enthusiasm—a high development of color often amounting to morbidness, to sensuality—an entire rejection of all rules, and often a defiant reaching after originality, to irreverence. In Germany we find the same cultivation of the intellectual powers with less enthusiasm—a more profound philosophical temperament with an unhealthy, because forced, imagination, and a different expression of irreverence manifesting itself in rationalism, and, in the Christian sects in a determined rejection of all revelation which does not accord with or cannot be explained by their own knowledge and reasoning ability; a want of faith and sympathy with the nobler divine truths. Accordingly we find, as in France, a knowledge of the principles of Art—a deep sentiment; fancy rather than imagination manifesting itself in extravagant vagaries, and a modification of the canons of old Art similar to that of religious doctrine; and in their landscape, corresponding to faithlessness and blindness to divine truth, though we find perfect realization of the lower truths of nature and actuality, they show no perception of the great landscape notions of light, space, and ideal color. In the English character is exhibited neither the profound erudition, the enthusiastic temperament, or the highly refined sensuous organization of the Gaul, or the meditative philosophy of the Teuton, but better than all, a strong reverence for truth and authority, preserving the nation from skepticism and anarchy; a deep religious feeling preserving its vitality, *and giving a peculiar value to talent when it does appear*. As would be expected there is in English Art feeble grasp of principles; a want of general susceptibility to color or sentiment; but a reverential regard for all authority, manifesting itself injuriously where that of Raphael and Rubens is placed before that of nature, but when acting freely on genuine talent, elevating it to very noble and perfect results.

The most important of the influences acting injuriously on nationality are, 1st. The habitual regarding with too great esteem the superficial qualities of art—execution, "style," and color, and the scientific light and shade, arrangement, &c., admirable acquirements, and necessary to the perfection of a school, but equally destructive when thought and all moral qualities are sacrificed to them. Execution is the result of study; let the artist think clearly and his execution will be bold; without thought it is the writing master's flourish; and so breadth of mass, of light and shade, are desirable, because they indicate a sys-

tematic method of thinking. Let the inner qualities be first attained and the expression of them will follow. In order to secure this, artists should educate themselves thoroughly. It is a most mistaken and fatal notion that a literary education is thrown away upon an artist, and there are many of our young artists who entertain it. The training of thought is ever the same, it is only subsequent direction of it that differs. 2d. Foreign study and following of foreign masters. We should think it strange if one should go to France or Germany to learn to speak English, and yet we go there to learn to think American, how to look at American nature, and study the characteristics of the American people! Was there ever such madness? Our artists spend abroad their most valuable and impressive years, when they should be storing their memories with a home thought, and founding a home feeling, and come back with sympathies, unnatural or entirely broken down by conflicting influences, and wonder at the appreciation of *Art*. No foreign master can enter into our peculiarities, and cannot, therefore, teach us how to study, which is all a master can do at the best. It is the same in landscape, and no better proof of this is needed than the rendering of American subjects by foreign landscape painters in the galleries every year. They may be, as in the "Trenton Falls," true to locality, and yet be entirely un-American. Thus the wonder of the ignorant of art that a self-taught artist should display great talent, should be reversed, and should be, that the *traveled* artist ever makes anything. 3d. The study of the old masters, which is worse than the foreign masters, because it defies the spirit of the age, and it is still oftener ruinous. It may be well to see what the artists of other countries and ages have done, but let it be as they would walk through a gallery, and then return to their own studios and to nature. When the early schools of Italy began their labors, it was under the impulse of a feeling calling for the expression of the great motives of the Christian religion; its faith, its hopes, the acts and sufferings of its Founder and his disciples. This feeling was the result of the strong love they bore to that faith, and the earnest desire to be reminded constantly of its offices and promises. When this feeling found more ready response in the reproduction, through printing, of the Bible, artists motiveless wandered back to Greece and the Pagan age, as we do now, in admiration of certain qualities of art, and then came the Renaissance and the fall. If the tuition of Raphael and Michael Angelo made only mannerists and imitators, what do we expect from the tuition of their works? Do our artists expect to find the elixir of life in the tombs, or do they think that the shell that could not keep the life in its own spirit will do better by ours? There is no necessity to go back, we have every thing in this, our day, necessary for its art. Let us express the present in its own terms.

4th. The deference to false ideals, classicalism, or any other ism except naturalism. After what has been said little remains on this, but we may point to examples of wreck on this rock as warnings. David Vernet, (the marine painter,) Barry, and in fact, almost all the early artists of the French and English schools, historical and landscape; Canova, and most of the modern sculptors who have been under his influence. A worse consequence of this false standard than the spoiling of weak artists, is, that it diseases the public taste, so that it cannot perceive the truth in the few who are strong enough to resist its tendency, and so kills by neglect those whom it fails to corrupt; and thus, both are the noblest artists deprived of sympathy, and the public lose all benefit from their labors.

The artists themselves should resist all extraneous authority, save as it enables them to see new truths in nature. By an habitual reference to this standard of every thing they do, they must, and will, attain to greatness, and an abiding influence on the future progress of art, however humble their talent may be, while the idealists, however vigorous, will be forgotten.

We have already alluded to the influence of home study in connection with the injurious influences, but it cannot be too strongly impressed on the artists, that by home study, and by that only, can a great nationality be attained; and the more *earnest* and *faithful* that study is, the more *readily* and *rapidly* will the desired aid be reached. The landscape painter who wishes to express the character of Ameri-

can scenery should follow every form of crag, of hill and tree, with the faithfulness of one who copies the writing of some unknown language in f. ar lest some important point should be omitted. When he has *pe fect command* of the smallest minutiæ he may dash out what he pleases; paint as broad'y, as artistically as he may, and use what license he will, his landscape will be unmis'akable American—the characteristics will be indelliby stamped on his mind. There is much in the influence of early association. The mellowed light of memory falls in softening, touching beauty on the scenes of our native valleys. Other lands may greet the artist's eyes, but he will remember none with the intensity of delight with which he dwells on that which is linked with his boyhood's frolic days.—This power extends far into the artists manhood, and should we not beware how we weaken it by too early wanderings?

That the artist shall follow, as far as his individual feeling will permit, such classes of subjects as appeal most strongly to the national feeling, is a truism almost always overlooked. Thus we find Vanderlyn painting Marius on the ruins of Carthage, when, with the same feeling and power, he might have painted a Washington in his reverses, and thus rendered vital a page in our history that would have borne the artist's name, and endeared him to the people, forever. The fact that third-rate painters have been so eager to seize such subjects, deters many of the better ones from taking them—they seek to establish an aristocracy of art, forgetting that it is by its very nature democratic. The success of these third-raters, owing entirely to their choice of subjects, should have taught them the power of the popular theme. They seek to violate one of their strongest instincts, because the people and the poor artists recognise and follow it. He who seeks immortality in this day, without enlisting the intelligent masses, reckons without his host. Our artists, our statesmen, our heroes, come from them, and the predilections with which they come out from the people remain with them. It is necessary therefore that the more childlike, the simpler feelings of humanity should be enlisted, that through them it may become mature in thought and judgment, for the uneducated are children in one sense.

The duty of the public towards Art is to be discriminating in their patronage, seeking out those indications of talent that point in the direction of true national feeling, and resisting all encroachments of an influence foreign to it, especially condemning all following or leaning to foreign schools; giving all facilities to home study and discouraging artists from going abroad until they have settled themselves in their nationality—till Americanism is indelibly stamped on their intellects and hearts. If we want representations of foreign scene or motive, let us get them from those who are better able to render them than an alien can be. It is the duty of the public to reward all *earnest* endeavor to enter into this nationality, whether successful or not, as deserving credit by the very attempt, and as positively to frown down all displays of mere superficiality, of cleverness and technical skill. Let artists be taught their works are valuable not in proportion to their ambition, but their earnestness; not for qualities of the hand, so much as the heart. There are springing up hundreds of young artists around us, and on the bent they now receive will depend mainly their future success, and what are we, as a nation, doing to insure it? We truly boast of being one of the greatest and wealthiest nations of the earth, and yet we have not one national gallery, or institution of art, except the Art-Union, not the slightest facilities are given by our government to the art student.

We can hardly leave this subject without alluding to those of our artists who have aimed at the great quality of which we have been speaking. Mount is the only one of our figure painters who has thoroughly succeeded in delineating American life, and his pictures, for that quality alone, are invaluable. Bingham has made some good studies of western character, but so entirely undisciplined and yet mannered, and often mean in subject, and showing such want of earnestness in the repetitions of the same faces, that they are hardly entitled to rank. Generally the artists seem to be possessed of a fever for high art, which in most cases is high nonsense. Why will Rothermel, with all his feeling, give us nothing but foreign subjects? or Page, with his magnificent power, ruin all his pictures by going back to subjects with

which neither he nor his age have any sympathy? In landscape we are much better as we ought to be. Durand appreciates and renders certain motives of American sc nery, beautifully. So to a certain extent did Doughty once, but by his gross mannerisms and superficiality he has almost destroyed all power.* Cole generally painted a medley, destitute of individual, local character; such as might be expected from a man who spent his best years abroad. His early pictures gave promise of strong nationality, destroyed in his latter idealism, but returning again in his last few years, and best shown in such pictures as the Mountain Ford and the view from Mt. Holyoke. He who studies thoughtfully our national character, can hardly fail to convince himself that the material for a mighty school of art exists here, and of which no obstacle but a false public sentiment can prevent the development.

* This expression we view as a wanton attack to cover the true motive—as with a veil—for the unmannerly and disgusting treatment this artist has received from the American (?) Art-Union, and should be thus viewed by our readers. It almost ruins the truly American sentiments that go before. —*Ed. Phot. Art-Journal.*

HELIOGRAPHY ON PLATES.

BY FRANCIS WEY.

Translated from the French, by J. R. Snelling, M. D.

INSTANTANEOUS PROOFS.

A FEW weeks ago, we requested M. Macaire to send us some counterproofs on paper, obtained from his plates and copied instantaneously from nature. This heliographer has more than acceded to our request; accompanying them he has sent us even the plates.

We have under our eyes, eight designs upon metal, which we hasten to describe, with but a faint hope of soon accomplishing our purpose; for, during the five hours that they have been in our possession, the just curiosity of friends and members of our Society has left us but a very short period. We take them at random:

No. 1. This is a stormy sky, overcast with heavy clouds, strongly marked, between which shines the sun's disc. The sea is very dark, for the sun is on the decline, and the waves impart to the shore the appearance of a dark coast. When we compare this sea with others which are in general very light, we are quite surprised to see the difference of vigor introduced into the local tone by the presence of the sun. The tint is so heightened that it is all variegated in the gradations of shade; it is a landscape of marbled ebony, with a diamond in the midst. Around the shining disc, the atmospheric zone is penetrated by a few gleams of light, which produces a misty appearance beyond the points of the luminous circle, and where the scintillations diminish in power. As for the sun itself, it is necessary to examine it with a magnifying glass. Those who have attentively observed this burning sphere with the aid of a dark glass, have no doubt noticed that it was more brilliant at its circumference than it appears at its centre. Almost imperceptible to vision, this double tint or incandescent light seems more unattainable with the sensitiveness of the daguerreotype, than white materials, which in general, is known to be burnt during the operation, and to slowly loose its demi-tints. Here, favored by rapidity of the exposition, the whiteness of the solar light is not rendered imperfect. In the proof of M. Macaire, the circumference of

the sun forms a more brilliant ring than the centre of the disc.

No. 2. A brig merchantman, all sails unfurled and leaving the port of Havre. Upon deck among the cordage we distinguish the busy sailors, and the captain who directs their movements, perfectly distinct, at the top of the main-mast a tri-colored flag floats in the breeze ; the canvas of the sails has the clearness of a piece of architecture ; the plowed water breaks around the keel of the vessel. At the right promenaders are scattered along the pier, from the side of which is presented a dense forest of masts ; on the left, the tower of Francois I. appears over a triple rampart, from the base of which shoots a light craft propelled by the oarsmen. These last are of the size of a very small ant—you may form some idea of the size of the oars ; however, one of them emerging from the water receives a stroke of the sun upon its edge, and dashes out a few drops of sea-water. With a glass of strong magnifying power we can count the drops which are thus thrown out.* The sky here and there is interspersed with flakes of clouds half dissolved in mist ; these incidents have been represented with an ineffable delicacy.

No. 3. The sky of the third sea is much more pleasant, ærial and complicated as are the details. It is separated into large round clouds illumined at the top, and which are gradually darkened towards the horizon. The demi-tints, from pearly whiteness to grey being maintained, abound *ad infinitum.* The sky alone would be a composition, but by seeing that it harmonizes, and by removing it to a distance of several leagues—by admiring these vast spaces boldly revealed in a vapor which envelopes the whole picture—the most fanciful allusion is acquired. It is no longer a design ; it is nature herself in harmony, at once so tranquil and so simple, that the idea of an object of art is banished from the mind. All is real ; we are distant from the coast where innûmerable small waves dash over, surging under the land breeze. And one of those two fishing boats which we see hauling the seine, leaving after it a very long train, shows the rapidity of the current ; the other proceeding slower suffers its net to hang, which descends in long waving folds. Can anything be more animated, more lively or better delineated ?

No. 4. But, here verily, is another affair ! forty portraits grouped, forty smiling figures, forty prattling children, a boarding-school of young girls, a host of small spirits, seized in their flight on leaving the school-room.

There they are, some sitting, others on their knees or squatting ; but most of them standing, and quite astonished at what is taking place before them But the astonishment will last but a short time, and it is necessary to hasten with the picture. The whole swarm of children are grouped along the school stair-case. Seven nuns with a flock so pretty impart a certain style to this hurried composition—yet, it is well arranged, and almost too much so. Why should it be ? The following circumtance takes place. They issue pell-mell from school, suddenly they see a strange instrument pointed towards them. The artist hurries to prepare everything for the operation, and, like the poet imploring the clemency of Time, exclaims,—cease your flight! wait you one second and even less! With their instinctive symmetry, our little coquettes arrange themselves, assume attitudes, and screw up their mouths. And, behold, a large group, arranged in two seconds, executed in the twinkling of an eye, yet which it has taken too long to prepare! Boys could better personate disorder, but would they have presented such pretty countenances—such delicate and transparent expressions, in the grace of their fugitive emotion ?

One regards the images ; another repeats the bead roll, this one draws forth a friar's bunch of keys, and stooping to her companions says : Finish, mademoiselle ! There is one nibbling a piece of bread, another jostles her playmate, and the youngest acts no part in what is taking place around her.

The picture is perfectly clear ; the little countenances are full of vivacity ; the dresses are shaded with accuracy. One of the most remarkable results of this manner of proceeding so rapidly is that all the colors are reproduced without alteration : the blue has not time to grow pale, nor the yellow to bronze ; the black as-

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* How truly wonderful is this fact.—*Ed. Pho. Art-Jour.*

sumes a relief, and the snowy white veils of the nuns, far from being solarized, have their folds and shades represented with perfect delicacy. The white dress of one of the pupils is of a wonderful finish. In regard to neatness and good deportment we have nothing but encomiums to bestow upon this scnool; the hands are clean, the collars are unrumpled, and the children's hair is very well combed. However, we would direct attention to a little girl with a square figured dress; a string is wanting for her right shoe. She did not recollect everything.

No. 5. We leave the town and return to the sea-shore, where we will follow M. Macaire along the cliffs which taper off upon the left. Upon the right an expanse of water intercepts the horizon. The ocean is quite calm, the sea subsides, leaving bare the sand banks, near which we perceive, at a quarter of a league, four or five dark points, like notes of admiration in miniature. In actual nature, we could not, without the aid of a telescope, distinguish these small objects: the magnifying glass is the telescope of Daguerrean nature. Then, these minute objects are three bathers; the body of one is half way in the water, the other as far as the neck, and the last almost entirely submerged. Near them is a boy with a basket under his arm, searching for shell-fish. Finally, farther on, a man stands, at the extremity of a neck of land, gazing upon a buoy which is carried along by the retreating wave.

Small boats with extended sails glide over the water which, in the distance vaguely reflects the splendor of the clouds. The cliff of St. Addresse is presented with great firmness; hence the transparence and fluidity of the sea. Yet when the eyes are directed to the sky, the comparison restores to the sea a remarkable solidity.

These lessons will not be lost upon marine painters, as they will teach what effect is produced by the relative state of the sky and water.

Upon these plates, it is impossible to confound the sun with the liquid element, or the sky and the sea. The strength of these is not weakened by the Daguerreotype; far from it; but the clouds are so profusely launched in space, they concur so intimately and with such pliancy in the harmony of the *ensemble*, that the sky is nothing more than a uniform background, very distant and without a single detached cloud.

No. 6. The method also admits of operating in quite a dark medium, and of reproducing with singular clearness the interior of an apartment. M. Macaire has transferred his apparatus to the cabinet of an amateur of curiosities, and there turning the back to the window, he has placed his object-glass opposite the wall upon which hang eight pictures in old frames. Below these pictures is a beautiful dressing table of oak, carved in the 16th century, supporting a great quantity of ware. Cupids of porcelain, a Saxony tureen small baskets of fruit, a carved goblet, a glass dish, a large pearly shell in a china plate, old glasses and crockery. Lastly, two lamps, upon the opaque globes of which is reflected the unique window of the hall —an arched window in which we distinguish the panes of glass. The shade and material of the objects are so well revealed that they are wholly unmistakeable: we might copy borders, and sketch landscapes in their least details, it is impossible to imagine an engraving more splendid or of finer effect. The full light of the sun has never produced a more striking proof.

No. 7. We are not so well pleased with a carpenter's shop in which a man is sawing a board. The opposites of light and shade are much too vigorous. However, this plate presents a curious phenomenon in the unaffected and accurate interpretation of movement. The position of the carpenter whose head is very fine, is taken in the act of working; the clutched hand which hold the panneling is an excellent piece of art which a sculptured model would fail to represent. At the side of the sawyer, compass in hand, figures a second person, who is no other than Mr. Macaire himself. These two portraits are very fine; but the accessories of the picture need repose.

No. 8. It remains for us to mention the most surprising of these eight designs. A view of the boundless sea, very rough, and upon the waves of which the sun darts a large fan of light which extends to the verge of the horizon. It is unquestionably the most fanciful picture in the world. The more we contemplate it, the more our curiosity increases; the whole detail is worthy of study. Never has heliography

in its short minute researches, drawn the asperities of rugged earth, or the arabesques of a gothic edifice with more rigid accuracy, than it has here by modelling the smallest ripples, and the most delicate details of this mobile element. Simple and diffuse as the general effect is, the detail is complicated. The most complete analysis of the waves is here given. Large surges rise and fall successively, and you survey the whole gaunt of light with its reflections and shades. The brightness of the wave or solar ray throws out a string of gold ; the deep tint of the vertical wave hollowed at its base ; the variegated and watery valley of water where the sky is mirrored ; the whiteness of the foam which sheets the troubled water ; the transparent and frothy verge of the watery mountains which roll and tumble,—so quick, so inconceivable in the rapidity of their changes—are fixed with an incomprehensible precision. The waves are darker far off, and the distant reflections of the sun grow darker without losing their sparkling vigor. Upon a second plain nearer, the strokes of light are more extended, and the shades sharper. At the feet of the spectator, the last billow dashes upon the burning strand among the dark pebbles of the coast. The heavens, very clear, descend until abruptly arrested by the line of water ; a remarkable solidity is thus imparted to this moving mass which conveys the idea of depth : we see very well that this firmament envelopes the ocean and continues beyond. Nature herself justifies here the customary coquetry of painters, by suspending a large cloud in the canopy of heaven, at the height of a second plane, which restores tone to the water. As if to still farther disguise this artifice several nebulæ follow this cloud. In respect to that portion of this sheet of water which escapes the direct action of the solar rays, they may still by slightly glazing, admit of some tints from the sky which would suffice to represent the capricious nature of the waves. Although it might be brought still nearer to perfection, the idealist thinks of nothing beyond this dazzling display.

We desire for the interest of the art, that Mr. Macaire should make new applications of his wonderful discovery. It would be very interesting to see upon his plates groves of trees in their true nature, and frequently their tops swayed by the wind. They are of a less olive green than the sea, and much less agitated. Now, the ocean is represented very light and clear, and we have no reason to doubt the superiority of results which would be required for vegetable nature.

The assimilation of these improvements to photography on paper, yet remains to be sought out ; it may, no doubt, be practicable, especially if, as M. Macaire has said, success is due not only to the employment of certain reagents, but to a modification in the construction of apparatus.

Should this able experimenter communicate the secret of his purposes, this new improvement would be promptly appreciated. We cannot, in this respect, but coincide with the liberal sentiments put forth by our co-laborer and friend, Dr. Clavel. M. Macaire is not the only one who has already obtained such curious proofs ; he has a rival in Mr. E. Bacot, who has likewise discovered an instantaneous method ; and which also reproduces the sea, the sun, and the clouds. Therefore, as M. Macaire took out a patent for the improvement as soon as his competitor—which in effect establishes his claims to equal priority, he may annul the effects of the privilege by revealing his manner of operating.

A denouement which has unreservedly for its aim the improvement of the discovery, would accord with our wishes. M. Niepce de St. V., M. Le Gray, M. Blanquart Everard, and several others, have generously contributed to the common work their knowledge and the result of their labors. Had these indefatigable researchers all guarded their secrets, would M. Macaire have at present such a fine secret to confide to us ? Without doubt he would not. Well, even as we have had the power to profit by our mutual efforts, so would he be useful in proportion as his labors become profitable to all.

It would be no more than justice, however, to present extenuating circumstances. M. Macaire seeks the application of his method to photography on paper ; he wishes to discover it himself. We must confess, this ambition is very natural Then, is it not right that an eminent artist in the ex-

ercise of an act invented by him should receive, indemnity for his many costly experiments? Assuredly we can readily conceive, that for the public good it would be very praiseworthy in government to acquire the process of M. Macaire, and remunerate the author of such a remarkable improvement.

It would be wise to secure to France the priority of a discovery which belongs to it, yet it may be impossible, unless immediate action is taken.

England already announces the invention of a still more rapid method than that of our countrymen; it is very zealous to appropriate our works, and particularly ready to declare that it previously invented what we discover.

On its part, America, where they would wish to rebuild the temple of Jerusalem, makes quite similar announcements. For the wants of their corsairs, the United States have conceived a humbug *au canard*, and have thus drawn from M. Niepce de Saint Victor the secret, yet incomplete, of the reproduction of colors. "*Apparently*," say they, "we have solved the problem."

Fearing to be superceded, M. Niepce has spoken, and suddenly all noise ceases on the other side of the Atlantic.

It is for M. Macaire's interest to reflect upon these examples; we live in an age when, if we desire to withhold all, it is necessary at the same time to show nothing and reduce everything to the most profound silence. M. Macaire has already said too much; moreover, his admirable works *speak loud*: he has rivals—he will have imitators, and the impulsion towards the heliographic progress is so strong, hopes are so sanguine, that it would perhaps be advisable that M. Macaire's secret should be communicated to the whole world before it becomes the whole world's secret.

The above is decidedly one of the most interesting papers on Heliography we have read for a long time, and announces a most wonderful discovery, which we think will —through the liberality of the public— soon be made known.—*Ed. P. Art Jour.*

AMERICAN ART-UNION.

THE boasting and puffing of this great medicine shop has failed to fill up its lists; owing to the excitement about Kossuth, and not at all to any doubts in the public mind that the committee are men of pure taste and noble liberality. A good deal of newspaper opposition is complained of by the committee, not as doing them any harm—quite the contrary—but to show the public what reward they get for their virtue: one case, however, is excepted; the Herald is prosecuted for a libel, for stating that the funds had been used to help establish an abolitionist newspaper. Mr. Henry J. Raymond, a member of the committee, and editor of the Daily Times, announces that the Herald will have an opportunity to prove its assertion in court.

In a manifesto in the Herald—which cooly takes their money for advertisements, and cuts them up for its own amusement—the committee say that the "institution" "has its ups and downs in point of income, and cannot calculate the extent of its receipts." "In '49 there were over 18,000 subscribers, in '50, less than 17,000, in '51, there may be 16,000 but, in '52 there may be 20,000." These figures are rather round—the two latter got at by guess, or clairvoyance, or uncertain calculation, we presume; as the committee next day gave different ones: however, we won't decide, but leave the reader to compare the following columns:

The Annual Report, 1849—18,960	Rough statement of Com.,	1849, more than	18,000	dif.	960
" " " 1850—15,310	" " " "	1850, less than	17,000	"	690
Statement of Com., 1851—18,384	" Estimate	1851, may be	16,000	dif. ab't	2,616

Falling off in 1850,	from more than	1,000	to 2,650,
" " " 1851,	" " "	1,000	to 3,926,
Gain in 1852,	" estimate,	4,000	to 7,616.

The "ups and downs" indicated by these figures have got the committee into a temporary fix, owing to their having purchased so many gems of art and published so many classic bulletins, engraved so many prints, celebrated in a critique of the London Art-Journal, a *part* of which they copied,—and paid so much for advertisements, &c., that they require 2,616 more subscriptions to pay liabilities; and in consequence of this melancholy state of affairs they have been obliged to violate their constitution, which prescribes that the election and distribution shall take place on the Friday evening preceding Christmas; and, the postponement until the 31st Dec., not having induced their faithful old subscribers to "register their names," they were forced again to violate their constitution, by a postponement until the missing 2,616 names shall be "registered." Meantime discontented persons are advertising their tickets for sale "at a discount," which is discouraging, as the market may be supplied by the stock already out, if holders take this view of the matter.

Of course we have no business to offer advice, as the committee is perfectly competent to do without advice, and has the confidence of the public, and all the subscribers, and twenty-one artists besides, who have got up a "card" to certify that they are not among those "many artists" who intimate that the managers are crooked in their ways, and extravagant in their doings; but what we would advise, if we were allowed, is that they should withdraw what they have over-purchased, and draw away for the remainder, more or less; and as for the $13,080, that will be easily borrowed upon $100,000 which they may get this year.

A number of would-be lawyers pretend that the managers have violated their contract with the subscribers, their constitution and all that; and say that the subscribers ought to demand their V's. back again, and if refused, to sue, under the statute against lotteries. But this evidently is unsound; for the Art-Union claims to have a monopoly of lotteries in the whole state. We do not see in its charter any thing to convince *us* that it has this monopoly, nor even a right to draw at all, except to determine which of its managers shall serve for three years, which for two years, and which for one year; but the Bulletin declares that the managers have the right, and would have had "one concern," indicted under the lottery law, had it not been that their own motives might have been misconstrued. However, it is not for us to decide what laws or charters mean, nor to guess what courts may do. Our readers if they have tickets to sell "at a discount," had better try first at the gallery to get the whole *value*; but in this case it will be but fair that they should return the Bulletins, and if required pay for the use of them, or else pay a shilling each for them, which is not more than a fifth of what the editor says they are worth.

Curiosity led us to look over the catalogue of paintings—as published in the "Bulletin"—offered for distribution for 1851 and the result of our investigation is as follows:

We find that the list comprises 310 paintings, by 132 artists. We find the names of two *German* artists, each mentioned 23 times; a third 27 times. Other foreign artists have each from five to fifteen paintings, while we find scarcely one of our own native artists having more than three. Doughty has but one—and this was not purchased, we are told, from him, but was procured second-hand—and Durand has but two.

Now, we would ask, what right has an institution to assume the title of *American* when it sacrifices native talent, of the highest order, to foreign assumption of, at least doubtful, reputation? We say doubtful reputation, for many of these foreign names are only to be found in the list of the Art-Union Bulletin.

We have no objection to the works of deservedly popular foreign artists being purchased by the Art-Union, or any other artists association, but we do protest against this wholesale exclusion of native talent, and we most sincerely trust, that our fellow-countrymen will either force the Art-Union to abandon its present policy, or abandon it to a deserved fate, and erect upon its ruins a truly national Art-Association.

THE HILLOTYPE; OR, DAGUERREOTYPES IN THE COLORS OF NATURE.

WE have been requested by a number of our first Daguerreotypists, to publish the two following communications to the *Philadelphia City Items*, and we give them as we find them. The writer deserves credit for his boldness, but we cannot agree with him in every point. We may take the liberty of reviewing the article in our Gossip.—*Ed. Phot. Art-Journal.*

At no period of the world's history, perhaps, could mankind be so easily imposed upon as at present. In the dark ages, as we like to call them, when ignorance prevailed to the same extent that knowledge does now, man was not so easily deceived in many matters. The assertion may appear broad, but a moment's reflection will convince every one, it is true. The many astounding discoveries in Science, made within the last half century, have so completely confounded the minds of the mass, that they are ready to embrace any *wonder* that may be announced. We no longer attempt to discriminate between the possible and impossible, but abandon ourselves to faith in every new fangled idea, comforting ourselves with the reflection that recent events have shown there is no knowing " what may turn up." The age is almost as prolific in Daguerrean as real wonders.

I have been led to these reflections from the latest extensively circulated and generally credited imposition, the news of which has spread not only over our own land and over most of Europe, and which is now on the point of exploding, under the name of Hillotype, or a method of taking daguerreotypes in the colors of nature. Before proceeding farther let me observe that the purpose of this communication is to expose the parties who have been mainly instrumental in *foisting* this imposition on the public, for I think it right that all should know to whom they are indebted for this scandalous attempt at imposition.

As for the Rev. L. L. Hill, (the pretended discoverer,) without doubt he has already profited by it in a pecuniary way; but for this he is indebted, not so much to his own talents, as to the assistance of others. Many have been *duped*, it is true, but they were duped less by Mr. Hill, than by Mr. Hill's friends.

But, as I observed, this humbug is about to explode, and the first shock is given in the last number of the D********* J******. This expose, however, comes with a bad grace from a publication which has been one of the main instruments in gaining credit for this imposition. The editor of this same "journal" has for nine months pretended to be in the confidence of the assumed discoverer, and has tired his pen-hand with glowing descriptions of the discovery. In the May number he writes—" Had Raphael seen one of these pictures, before finishing the Transfiguration, he would have dropped his pallet in disgust, and painted no more." (I do not know that I quote his words, but I give the sense.) It was this editor who christened the " Hillotype," who published a like-

ness of Mr. Hill, pronouncing him "one of the greatest men that has ever lived," who has omitted no opportunity of extolling the discovery and the discoverer; and this same man, now comes out, exposing the affair, and pronounces the pictures which he has seen infinitely worse than any transfer, and not made in the *Camera* at all. So much for Mr. H*******.

But, *another* has figured, if not as conspicuously, yet quite as mischievously in this matter; for it was through his representations and influence that this barefaced imposition received full credit in a number of respectable and widely circulating Journals. I will particularize the *North American*, *Public Ledger*, and *Saturday Courier*, which papers were imposed upon so far, as to give glowing descriptions of the "Hillotype," like those in the D********** J******, and assuring their readers of the genuiness of the discovery; thus giving a credit and publicity to this deception which it could otherwise never have attained.

I hope these papers will now do themselves the justice to inform the public from whom they received their information. Let us have the name of the "*gentleman on whom they place implicit reliance.*" Artfully as he has thus far concealed himself, it is but right that the public should know him.

In conclusion, I will state that the motives for this imposition are as well known to me as the persons who have been instrumental in foisting it on the public. In an article which I prepared some three months since, these motives were set forth.

The article was offered at the time to the *Ledger*, but was refused, firstly, on the ground of its length, and secondly, that it contained opinions differing from those just published by Prof. Morse, who appears to have been (as *usual*) most egregiously deceived in this matter.

The article referred to is still in my possession, and if you think it is of sufficient interest to your readers in general, you would much oblige *one* by publishing it in your next number.

Not being terrified by the threats of Mr. Hill to "prosecute such persons as seek to throw odium on his discovery," I shall not shrink from the responsibility of giving my name, should any of your readers require it.

And so with gratitude for the valuable space you have suffered me to occupy, I am sir, yours truly,

A Practical Daguerre.

Mr Fitzgerald—Dear Sir—I propose to examine some of the testimony for and against this discovery—(so call d.)

Mr. L. L. Hill, or the Rev. L. L. Hill, a retired clergyman in the State of New York, publicly and positively, through the press, asserts that after long and tedious experiments he has made such a discovery, and describes the effects as beautiful almost beyond belief, exceeding the ordinary daguerreotype so far in correctness, that, to use his own words, "after the discovery is known, one would as soon think of sitting down with pen and ink and paper to make a likeness, as to make one by the present daguerreotype process."

As far as I can learn, Mr. H. is highly spoken of by his neighbors, all of whom, I am told, express full confidence in the *man* and his discovery. Furthermore, Mr. H. has, since the announcement of his discovery, been visi ed by a large number of daguerreotypists and others, who appear to have gone for the purpose of satisfying themselves of its falsity; they have all been hospitably entertained, and, it would appear, return very much prepossessed in Mr. H's favor.

For some time this remained the sum-total of the evidence; for though Mr. H. announced that he had quite a number of *specimens* made by the new process, he also announced his determination not to show these, till such time as he had taken the necessary steps to secure his invention.

Soon after, a gentleman of this city, a man of reputation, and whose name is extensively known in connexion with his business, not only in this city, but in a great part of the country, stated to many of his friends that he had been shown the specimens, or a portion of them, made by the new process of Mr. Hill, and that he was furnished with a letter from Mr. H. testifying to the fact that he, Mr. H. had shown to the gentleman in question specimens of the new invention;—so that the discovery of Mr. H. has *one* endorser, though,

for what reason I cannot say, that endorser does not see fit to appear before the public over his own proper name.

As I have now, I think, fairly stated *all* the reasons for believing in the genuineness of the invention, permit me to give *some* of the reasons for suspecting that the whole affair is a deception practiced upon the public, and upon the Daguerreotypists in particular, for the aggrandisement of those concerned. And, in making this statement, I wish it to be distinctly understood that it is not done from any spirit of opposition to the invention or those concerned in it. For the honor of our country, for the benefit of mankind and for the dignity of the art in which I am engaged, I do most fervently wish that *all* that is claimed for the invention may prove true; and as I feel the justice of my motives, and do not wish to shrink from any responsibility in the matter, I shall, with this communication hand you my name.

The first notice that I and many others had of Mr. Hill was two years ago, when Mr. H. sent circulars to the Daguerreotypists throughout the country, announcing the fact that he would shortly publish an important work on daguerreotyping. The work was to be mailed to such as would send their address with $5.00, to the author. Upon the face of this circular was a certificate signed with several names, stating that Mr. H. was a respectable Baptist Preacher and that implicit reliance might be placed upon him. The volume was published; it contained about a hundred pages in paper covers and might have cost the author from twenty to thirty cents per copy. Of the ten thousand daguerreotypists then in the United States, it is a fair presumption that three in ten purchased the book, the author would thus realize at least fourteen thousand dollars clear money by the speculation.

Of the contents of this work, I will only say that it is made up, principally, of extracts from the writings of early experimenters in the photographic art, which, however interesting they might have been at their first publication, had in a great measure ceased to be so from the fact, that experience has shown the fallacy of much that was at first advanced. Now, putting this forward at this time as the result of practice, is a positive injury to the novice.

Besides this, there were a number of recipes, many of which are ridiculed by chemists as sheer nonsense, and others, some of which are contradicted by Mr. H. himself in his subsequent writings; in short, amongst the profession, as far as my knowledge extends, the volume is held in contempt. Some time after, Mr. H. announced another new work, the price to be three dollars. This volume also soon appeared and proved to be the *first* work with an addition called part second, and part third; they were (that is the original portions,) of as little value as the first, but as great pretensions were made for the book, perhaps quite as great a number were sold, especially as the purchaser received double as much for his *three* as he did before for his *five* dollars. It is, therefore, perhaps, a safe inference that the author realized at least half as much by this work as by the former.

But, this is not all, for shortly, comes another flaming announcement from Mr. H. of still another work, which work was to expose the "*four great secrets*" of the Daguerrean craft, the price of the work to be five dollars. This work, also, soon made its appearance, it is about the size of a child's primer, and contains, title page and all, twenty-two pages.

Now, whether Mr. Hill has made the discovery he claims, or not, every man who has a knowledge of the Daguerrean art must admit, (I have never spoken to one who does not admit) that this little pamphlet is an *imposition* in every sense of the word.

As a fair specimen of the ridiculous nature of the recipes given, I will just mention, that in one article the reader is directed to dissolve gold, platina and *iridium* in nitro-muriatic acid, and then the writer says that the metals platina and iridium confer qualities on the article, possessed by nothing else of the kind.

Now, when it is considered that iridium is not soluble in nitro muriatic acid, this recipe becomes ridiculous enough, but this is on a par with all else contained in the pamphlet under notice.

On the cover of this five dollar *morceau* is the following announcement:

Now, as the number of daguerreotypists had increased, by this time, to about fifteen

thousand, should one in five purchase the book, over fourteen thousand dollars would be realized upon it by the author.

"Several years' experiments have led us to the discovery of some remarkable facts in reference to the process of daguerreotyping *in the colors of nature;* for instance, we can produce *blue*, *red*, *violet* and *orange*, on one plate at one and the same time. We can also produce a landscape with these colors fully developed, and this we can do in only one third more time than is required for a daguerreotype. The great problem is fairly solved; in a short time it will be furnished to *all* who are willing to pay a moderate price for it. Our friends will please keep us advised of their P. O. address."

The next we hear of Mr. Hill is his public announcement of his "Great discovery" in the "D********** J******," giving an account of the manner of discovery, disagreeing with—almost contradicting, the announcement on the covers quoted above.

Immediately the press teemed with accounts of Mr. Hill's wonderful discovery, giving full credence to the truth of all alleged, and, in some instances, very nearly endorsing it. An excitement in which no one seemed to look at the incongruities and contradictions in the accounts,* spread over the whole country—the house of Mr. Hill was beseiged by eager applicants for patent rights and persons anxious to embark in the Hillotype business. They were told that the first step was to learn the daguerreotype business, and many became pupils of Mr. H. paying fifty dollars as I am informed, for a few days instructions.

So intense had the excitement, at length, become, that Mr. H. announced that he was compelled to shut his doors against any more visitors. Now, amidst all this excitement, some people predicted that Mr. H. was about to give the world another volume, and they were not mistaken, for the Daguerrean fraternity soon received from Mr. H. through the Post Office, a prospectus for *another book*, the price of which would be three dollars. The prospectus makes free use of many of the newspaper articles laudatory of himself and his invention, among others the *Saturday Courier* and *North American* of this city. Besides this, the author so uses the names of many of the gentlemen who have visited him, that the careless reader would suppose that they also endorsed the whole affair. The reader is informed, very cunningly, that the surest way for him to be remembered by Mr. H. will be to send an order for the book, and, furthermore, that this book is but the forerunner of another that will shortly be published for the benefit of such operators as secure patent rights!

The promised volume made its appearance about the first of May The author, aided by the excitement which has been mainly brought about and kept up by the public press, may realize from ten to twenty thousand dollars from this alone; but from those who have purchased and read it, I have heard but one opinion—namely —that the book is next to worthless; it is in fact, what has before been published by M. H. with some slight interpolations and additions.

Many months have elapsed since the discovery was announced, yet nothing has been done to secure a right or prove the invention; no wonder there are doubters, and when these facts are added to the fact which all seem to have forgotten or overlooked, that the invention, as *claimed* by Mr. H. is in direct contradiction to every known fact that the point upon which Mr. H. bases his discovery, namely, "the existence of a *latent colored* image upon the iodized silver plate," is in opposition to the known rules of science, to the writings of the most celebrated experimenters and to the daily experience of every practitioner of the Daguerrean art, it becomes obligatory on Mr. H. to prove his invention, before he ask credit for it.

For all that I have here advanced as fact, I hold myself responsible, and am ready with the proofs whenever they shall be demanded.

A Practical Daguerre.

* Our author could not have seen the June No. of the Phot. Art-Journal, or he would have justly given us credit for having been the first to point out these discrepencies. We received any amount of abuse for that article, but every word we then wrote has been fully confirmed by recent events.

PHOTOGRAPHIC MANIPULATION.*

Part I.

CONTAINING THE THEORY AND PLAIN INSTRUCTIONS IN THE ART OF PHOTOGRAPHY, OR THE PRODUCTION OF PICTURES THROUGH THE AGENCY OF LIGHT.

BY ROBERT J. BINGHAM,

Late Chemical Assistant in the Laboratory of the London Institution.

THE calotype process has been much simplified by Mr. Hunt, to whom we are indebted for the greater number of processes on paper at present known, and whose valuable researches on the chemical effects of light have added so greatly to our knowledge of that mysterious agent.

69. Mr. Hunt has shown that the action of light on nearly all the salts of silver may be hastened, and the effects developed by gallic acid, or other reducing agents, and he has given several formulæ for producing pictures. We supply one which we have found the best, but the principle is the same in all. An insoluble salt of silver is formed in the paper having a slight excess of the nitrate, this is exposed to light, and then brought out by a solution of gallic acid, or protosulphate of iron. The following Mr. Hunt calls

FLUOROTYPE.

70. A sheet of paper is to be washed, first, with a solution of bromide of potassium, and then with the fluate of soda, or, which will be found the better plan, the two salts may be united. The strength should be as follows :—

Bromide of potassium, 20 grains.
Distilled water, 1 fluid ounce.
Fluate of soda, 5 grains.
Distilled water, 1 fluid ounce.

Mix a small quantity of these solutions together when the papers are to be prepared, and wash them once over with the mixture, and when dry, apply a solution of nitrate of silver, sixty grains to the ounce of water. These papers keep for some weeks without injury, and become impressed with good images in half a minute in the camera. The impression is not sufficiently strong when removed from the camera for producing positive pictures, but may be rendered so by a secondary process.

71. The photograph should first be soaked in water for a few minutes and then placed upon a slab of procelain, and a weak solution of the proto-sulphate of iron brushed over it; the picture immediately acquires great intensity, and should then be stopped directly, or the blackening will extend all over the paper; it may be fixed by being soaked in water, then dipped into a solution of hypo-sulphite of soda, and again soaked in water as in the other processes.*

72. We find it is better to add to the proto-sulphate of iron a little acetic or sulphuric acid; this will be found to prevent the darkening of the lights of the picture to a great extent; it will also be better not to prepare the paper long before it is required for use, this being one reason why the picture often becomes dusky on application of the proto-sulphate.

Reasoning upon the principle that the action of light is to reduce the salts of silver in the paper to the metallic state, and that any substance which would reduce silver would also quicken the action of light, we were led to the following experiment: The proto-chloride of tin possesses the property of reducing the salts both of silver and of gold; a paper was prepared with the bromide of silver, and previously to exposing it to light, it was washed over with a very weak solution of the chloride of tin; the action of light upon the paper was exceedingly energetic; it was almost instantaneously blackened, and a copy of a print was obtained in a few seconds; this

* Continued from vol. 2, No. 6, p 335.

* For further particulars of this and other very beautiful photographic processes, see Mr. Robert Hunt's valuable "Researches on Light."

was performed last summer. We have lately tried once or twice to repeat the experiment, but without success; the paper being blackened in the dark spontaneously. We hope, however, to perfect a process which gives so much promise.

FERROTYPE OR ENERGIATYPE.

73. Mr. Hunt some little time ago announced a process he then called the Energiatype, from an opinion of his, that the effects produced were not by light, but resulted from a peculiar principle he denominated Energia; he has, however, since altered the name to Ferrotype, which includes all the processes in which proto-sulphate of iron is used as a reducing agent. The original process was as follows:—a solution is prepared by dissolving two drachms of succinic acid, and five grains of common salt, in one fluid drachm and a half of distilled water, having previously added half a drachm of mucilage of gum arabic; this is applied to the paper, and when dry, is to be washed over with a solution of nitrate of silver, containing sixty grains to the ounce of water; it is allowed to dry in the dark, after which it is fit for use. It may be preserved in a portfolio, and placed in the camera when wanted. The time necessary for exposure varies from two to eight minutes, but like the calotype no image is at first visible; in order to bring out the latent picture, it is necessary to wash it with a saturated solution of proto sulphate of iron, to which has been added two drachms and a half of mucilage of gum arabic; we find it is an improvement in this process as well as in the Fluorotype, and, indeed, in all cases when the proto-sulphate of iron is used, to add to it a little acetic acid (§ 61).

74. It is not essential to use the succinate of silver, for Mr. Hunt finds that the picture may be produced either with the benzoate, the bromide, the iodide, the arseniate, or, indeed, nearly any one of the salts of silver. The proto-sulphate of iron has this advantage, that pictures may be produced much more quickly by its means than by any other method; when used instead of gallic acid in developing an ordinary calotype picture, the quickness is extraordinary, and engravings, &c. may be copied absolutely instantaneously.

75. Mr. Hunt has modified this process in a very ingenious way; he has taken advantage of the property possessed by the oils of cassia and of cloves in precipitating metallic silver, as in Drayton's process for silvering mirrors, but he finds that the silver will be precipitated more readily upon those parts where the light has acted. The following is the process:—

The paper, after being submitted to the influence of light, is immersed in spirits of wine containing in solution a small quantity of the essential oils of cassia and of cloves, and as soon as the spirit has penetrated the paper, it is to be pressed between folds of blotting paper previously saturated with the same solution, and then pressed together between two pieces of plate glass; in the course of an hour or two the picture will be developed very beautifully, and may be fixed in the ordinary way.

CHROMOTYPE.

76. This is another process for which we are also indebted to Mr. Hunt, and it has this advantage, that it is a positive process; that is, a copy of an engraving is produced at once, with the lights and shades correct; it is also one of the most simple and easily managed, and the pictures produced are very beautiful. The process was made known at the Meeting of the British Association, August 1843. We give Mr. Hunt's description of this process.

One drachm of sulphate of copper is dissolved in half an ounce of distilled water, to which is added half an ounce of a saturated solution of chromate of potash; this solution is applied to the surface of the paper, and, when dry, it is fit for use, and may be kept for any length of time without spoiling. When exposed to sunshine, the first change is a dull brown, and if checked in this stage of the process we get a negative picture, but if the action of the light is continued, the browning gives way, and we have a positive yellow picture on a white ground. In either case, if the paper, when removed from the sunshine, is washed over with a solution of nitrate of silver, a very beautiful positive picture results. In practice, it will be found very advantageous to allow the bleaching action to go on to some extent; the picture resulting from this will be clearer and more defined than that wish is procured when the action is checked

at the brown stage. To fix these pictures it is necessary to remove the nitrate of silver, which is done by washing in *pure* water; if the water contains any muriates the picture suffers, and long soaking in such water entirely destroys it, or if a few grains of common salt are added to the water the apparent destruction is very rapid. The picture is, however, capable of restoration; all that is necessary being to expose it to sunshine for a quarter of an hour, when it revives; but instead of being of a red color, it becomes lilac, the shades of color depending upon the quantity of salt used to decompose the chromate of silver which forms the shadow parts of the picture. We find that, by substituting sulphate of *nickel* for the sulphate of *copper*, the paper is more sensitive, and is more clearly developed by the nitrate of silver.

77. Mr. Hunt has since modified this process—we give his account: "A neutral solution of the chloride of gold is mixed with an equal quantity of the solution of bichromate of potash. Paper washed with this solution, and exposed to light, speedily changes, first to a deep brown, and ultimately to a bluish-black. If an engraving is superposed, we have a negative copy, blue or brown, upon a yellow ground. If this photograph is placed in clean water, and allowed to remain in it for some hours, very singular changes take place. The yellow salt is all dissolved out, and those parts of the paper left beautifully white. All the dark portions of the paper become more decided in their character, and, according as the solarization has been prolonged or otherwise, or the light has been more or less intense, we have either crimson, blue, brown, or deep black negative photographs."

78. A process with the bichromate of potash has also been announced by Mr Mungo Ponton. Paper should be soaked in a saturated solution of the bichromate of potash, and then exposed to sunshine; a delicate buff colored negative picture upon a yellow ground will be the result. To fix these pictures, all that is necessary is to soak them in common water, when the yellow color will disappear, and they will be perfectly white,—this is a simple and easy process, the *rationale* of which appears to be this:—Bichromate of potash consists of chromic acid and potash; under the influence of light, the starch in the size of the paper and the chromic acid react upon one another, and it is very probable that the acid is partially reduced, for, with paper having very little size, the bichromate bears a much longer exposure. A knowledge of these facts has led to a pretty modification of this process by M. Edmund Becquerel: he directs that paper should be steeped, in a weak solution of iodine in alcohol and then copiously washed in water, it will then assume a beautiful blue tint; if this tint be uniform the paper is deemed proper for the experiment, otherwise the operator must size it himself with starch. It is afterwards to be steeped in accordance with Mr. Ponton's method, in a concentrated solution of bichromate of potash, and the superfluous moisture removed by bibulous paper and dried; it is now ready for exposure to light; in order to copy an engraving it will require a time varying from one minute to fifteen according to the thickness of the paper of the engraving and the intensity of the light. After the exposure, wash the paper well and when dry steep it in a weak alcoholic solution of iodine, after it has remained some time wash it in water and then dry it between the folds of blotting paper, but not before the fire, for the compound of iodine and starch is discolored at about 212° Fahrenheit. If it is thought that the copy is not sufficiently brought out, repeat the immersion several times; by this means you may obtain any degree of intensity of tone that you may wish the picture to have. In this process the chromic acid seizes upon the starch over those parts which have been exposed to light. Now, as starch possesses the property of forming with iodine a combination of a very fine blue, it is evident that on those parts of the paper which have not been impressed by the solar rays, the starch will not have combined with the chromic acid; the iodine will therefore form the blue iodide of starch, and thus represent shade by shade.

CHRYSOTYPE.

79. This is a process discovered by Sir John Herschel, in which iron and gold are used as photogenic materials. Good paper is to be washed with the solution of the ammonio-citrate of iron, dried, and afterwards washed over with a solution of ferrosesqui-

cyanuret of potassium. This paper should be dried in a perfectly dark room, when it will be ready for use in the camera. After it has been exposed a short time, the picture may be developed by washing it with a neutral solution of gold, of such a strength as to appear of the color of sherry wine; the image instantly becomes visible, and may be fixed by being well washed in water, dried by blotting paper, and then again washed in a weak solution of the iodide of potassium. Should the picture not have been well washed previously to the application of the iodide of potassium, the lights will become discolored, but will speedily whiten again spontaneously.

CYANOTYPE.

80. Sir John Herschel is also the originator of this process, or rather a number of processes, for it includes all pictures taken with salts of iron, particularly when in combination with cyanogen. Paper is washed over with a moderately strong solution of the ammonio-citrate of iron, and exposed in the ordinary way until a faint negative picture makes its appearance. A saturated solution of the common ferro-prussiate of potash, in which is dissolved a little gum arabic, is then to be rapidly passed over the paper, when the negative picture disappears, and is replaced by a blue one, having a green ground. This picture requires no fixing.

81. Another method, which requires a longer exposure to the sunshine, possesses this advantage—the lights of the picture are white, and the shadows of a beautiful blue. The following is the mode of preparation:—Wash paper over with the solution of nitrate of mercury, and, when dry, with a saturated solution of sesqui-cyanuret of potassium. It is now ready for exposure, which should be continued until the required degree of intensity in the color is produced. The picture may be fixed by soaking in cold water, to which a little alum has been added.

82. A very interesting and curious process was discovered by Sir John Herschel, by which latent pictures can be produced, which are capable of being developed by the breath, or by a moist atmosphere. If a solution of nitrate of silver, specific gravity 1·200, be added to ferro-tartaric acid, specific gravity 1·023, a precipitate falls, which may be again nearly redissolved by a gentle heat; a yellow liquid is obtained, in which further addition of the nitrate causes no turbidness. When the total quantity of the nitrate solution amounts to one-half the bulk of the ferro-tartaric acid, it is enough. The liquid so prepared does not alter in the dark. The paper is to be spread over with this solution and exposed wet to sunshine (but partially shaded); for a few seconds no impression seems to be made, but by degrees, although withdrawn from the light, it developes itself spontaneously, and at length becomes very intense. But if the paper be thoroughly dried in the dark, it possesses the singular property of receiving a dormant or invisible picture, to produce which (if it be, for instance, an engraving which is to be copied) from thirty seconds to a minute's exposure to sunshine is requisite. It should not be continued longer than that time, as not only the ultimate effect is less striking, but a picture begins to be visibly developed, which darkens spontaneously after it is withdrawn. But if the exposure be discontinued before this effect is produced, an invisible impression is the result; to develop which, it is only necessary to breathe upon it, when it very speedily acquires an extraordinary intensity and sharpness, as if by magic. Instead of the breath, it may be subjected to the regulated action of aqueous vapor, by laying it in a blotting-paper book, of which some of the outer leaves have been damped by holding them over warm water.

POSITIVE CALOTYPE.

83. At the second Meeting, at York, of the British Association, Professor Grove described a process by which positive pictures could be taken at once, without the trouble of having to make a negative in the first instance. Ordinary calotype paper is darkened till it assumes a deep brown color, almost amounting to black; it is then redipped in the ordinary solution of iodide of potassium, and dried. When required for use, it is drawn over diluted nitric acid, one part acid, and two and a half parts water. In this state, those parts exposed to light are rapidly bleached, while the parts not exposed remain unchanged. It is fixed by washing in water, and subse-

quently in hyposulphite of soda, or bromide of potassium.

Mr. Grove likewise described on the same occasion another process which promises when carried out, to be of great utility. It is the conversion of a negative calotype into a positive one, and was thus stated: Let an ordinary calotype image or portrait be tak n in the camera, and developed by gallic acid; then drawn over iodide of potassium and dilute nitric acid, and expo-ed to full sunshine; while bleaching the dark parts, the light is redarkening the newly precipitated iodide in the lighter portions, and thus the negative picture is converted into a positive one.

CATALISOTYPE.

84. The above name has been given to a process described by Dr. Wood:—The paper to be prepared is steeped in distilled water, to which has been added hydrochloric acid in the proportion of two drops of the former to three ounces of the latter; when well soaked, the moisture is to be lightly absorbed by blotting paper, and washed over with a mixture of half a drachm of syrup of ioduret of iron, in two and a half drachms of water, into which one or two drops of a solution of iodine may be dropped. It is now to be dried with bibulous paper, and washed over evenly with a solution of nitrate of silver, twelve grains of the salts to the ounce of water. It is now ready for the camera, the time of exposure varying from a second to half a minute, according to the degree of light. When removed from the camera no picture is visible, but if left in the dark it gradually developes itself, and ultimately becomes extremely perfect. It is fixed by washing first in water, and afterwards in a solution of bromide of potassium (twenty grains to an ounce), after which it must be again carefully washed and dried. Mr. Mayall has informed us, that instead of using the syrup of ioduret of iron, it is better to use the ioduret of iron dissolved in gum-water: we have seen some very good pictures produced by him with this modification of the Catalisotype.

85. A process has been proposed by M. Gaudin, (which appears to be a modification of one mentioned by Dr. Schafhaeutl and of Mr. Hunt's Ferrotype):—The paper is exposed for a minute in the vapor of hydrochloric acid, after which a nearly saturated solution of nitrate of silver is to be brushed over its surface, and allowed to dry. The dry sheet is placed in the camera in the dark. On removal no trace of the image will be visible; but upon wetting the paper with a nearly saturated solution of *sulphate of iron*, slightly acidified by the addition of a few drops of sulphuric acid, the picture is immediately developed. The time necessary for exposure in the camera is much about the same as for the calotype. To fix the picture which is a negative one, it must be first washed in common, and subsequently in distilled water, to which has been added ten per cent. of caustic ammonia. This is stated to be a good paper for obtaining positive pictures from negative ones; for which purpose, however, the sulphate of iron need not be used.

PHOTOGRAPHY ON GLASS.

86. Some time ago, Sir John Herschel, in his experiments with photographic agents, found that glass plates might be made use of with advantage for supporting the film of sensitive matter; his method of proceeding was to pour into a deep vessel a solution of iodide of potassium extremely diluted, to add to a very small quantity of the nitrate of silver so as to obtain a liquid only slightly milky; at the bottom of this vessel, he laid horizontally a glass plate, and allowed the iodide to become very slowly deposited; the liquid was then carefully drawn off by means of a syphon, and the last portions by a little tow or blotting paper: when this was dry, he had a pure and uniform film of the iodide of silver. This plate was then placed at a very small inclination, and a weak solution of the nitrate of silver poured upon its upper edge; it flowed over at one of the corners; it was then put in the camera in the same manner as we should a Daguerreotype plate; was moderately sensitive, and darkened to a good black in a short time.

Sir John Herschel observes, that "if we wash pictures obtained in this way with the hyposulphite of soda they disappear, but this is only whilst they are wet; for upon washing with pure water and drying, they are restored, and assume when laid on a black ground much the appearance of a Daguerreotype, and still more so, when

smoked at the back, the silvered portions reflecting most light, so that the character is changed from a negative to a positive drawing. To obtain delicate pictures the plate must be exposed wet, and when withdrawn should be immediately plunged into water, that the nitrate of silver which is liable to crystallize may be abstracted." This process, however, is rather troublesome, and the chloride or iodide is very liable to come off the plate in the various washings to which it is necessary to subject it; neither are the shades sufficiently intense to obtain a good positive picture. We have made many experiments on this subject, and have lately produced several negatives on glass which appear very promising. By one of the following processes very good results may be obtained:—

87. *First Process.* Beat for about ten minutes the whites of two or three eggs, then cover up the vessel, and allow the froth which is produced to resume the fluid state;* pour a little of this liquid upon a piece of clean glass (previously adjusted by set screws to a perfectly horizonal position) and spread it evenly over the surface, using the edge of a piece of smooth and clean writing paper for that purpose; allow this layer of liquid to get quite dry, and then submit it to a heat of about 212° for two or three minutes; now prepare a solution of nitrate of silver containing 200 grains to 4 ounces of distilled water; pour this into a shallow dish, and then suddenly plunge the plate of glass into it; the solution should run over the whole surface at once, otherwise the coating will not be uniform: take the plate out and rinse it for a second or two in a basin of distilled water; and then put it into a dish containing a solution of iodide of potassium 10 grains to 1 ounce of water, let it remain for a minute, and then again wash it well in distilled water for about ten minutes; the glass must then be taken out, suspended by one corner, and allowed to dry; a number of glasses may be thus prepared and kept until required for use. To render the plate sensitive it is immersed into a solution of gallo nitrate of silver prepared as described for the ordinary calotype process at § 55; this should be diluted about twenty times; let the glass remain in the dish about three or four seconds, then take it out and shake off the superfluous liquid; it is now very sensitive to light, and may be used either at once or kept without spoiling for ten or twelve hours. After the picture has been impressed in the camera it may be brought out by pouring over it gallo nitrate of silver (§ 59); as soon as it is fully developed, it should be washed in a little water, and then placed in a solution of hypo-sulphite of soda (§ 63) for about ten minutes, and afterwards washed in a quantity of common water and dried in a warm place.

88. Beautiful positives may be obtained from these plates, having a degree of delicacy which cannot be attained in any other way; the process is precisely the same as that from a paper negative (§64;) but the positive picture may be produced upon another piece of glass prepared in the same way.

89. *Second Process.*—Obtain some very clear isinglass, pour it on a little hot water, so as to produce a thick jelly; while still warm and fluid, mix with it a few drops of strong solution of the proto-iodide of iron, pour a little of this mixture over a piece of glass, and drain off the excess at one corner; allow this to get perfectly dry and hard, when suddenly immerse it in a solution of nitrate of silver, containing 100 grains, in two ounces of distilled water; it is now sensitive to the action of light, and should be at once placed in the camera. A very light picture will, perhaps, only be visible; but it may be fully developed by putting it into a solution of the proto-acetate of iron containing a small excess of acetic acid. As soon as the picture is fully developed, it should be rinsed in a little water, and fixed with hyposulphite of soda, as in the preceding process.

90. We may, in place of the gelatine (isinglass), employ a number of other substances to form an adherent film upon the glass. The following are a few of those we have experimented with, and found to answer moderately well;—Vegetable gluten, dissolved in acetic acid, forms a very tenacious coating, and difficult to remove. Collodion (gun cotton dissolved in æther)—the spirit of wine varnishes—a mixture of albumen and gelatine, in equal proportions, applied as directed for albumen alone

* M. Niepce de St. Victor first suggested the use of albumen for making a film on a glass plate on which to apply the sensitive coating.

in the first process, and then immersed in an infusion of oak bark. Several of the gums, starch, casein from milk, vegetable albumen, &c. The method of applying the solutions may be varied in a number of ways, and opens a wide field for experiment When starch is used as a film upon glass, the iodine and bromine requisite for converting the nitrate of silver into the iodide or bromide may be advantageously applied in the state of vapor as in the Daguerreotype process; if a plate of glass, covered with starch, be exposed to the iodine vapor, it will gradually assume a fine violet color from the formation of iodide of starch. When immersed in the nitrate of silver, the violet color disappears, and is replaced by the pale primrose of the iodide of silver. If the starch plate is exposed to bromine, a red color is produced, which, on immersion in the nitrate solution, disappears, and the white bromide of silver is produced.

91. Since the foregoing paragraphs were published in January 1850,* a patent has been granted for certain improvements in photography; many of which, however, were well known and practised by amateurs of the art, previous to the date of the patent;† amongst other things claimed is the production of positive pictures on glass. Now we have seen that Sir John Herschel, in his experiments on glass plates made some years ago (§ 86), mentions that the negative photograph is also a positive one, according as it is seen by reflected or transparent light; and we may confidently say that any one who had experimented with the glass process prior to this new patent, must have observed that in nearly every instance the negative is also a positive picture, particularly if it has been a long time in the developing mixture (described § 86).

92. In paragraph 90, we described a photographic process on glass, in which the fumes of iodine are used for impregnating the coated glass; this was published January 1850. In June 1850, Mr. Malone, in a letter, to the *Athenæum*, and in his patent specification, described the application or iodine to all photographic surfaces, excepting metallic plates, as his discovery; now this has been known and used for some years. Mr. Hunt, in a work written by him, and published in 1841,* mentions that paper may be usefully impregnated with iodine by exposure to its vapor. In a process by Dr. Schafhaeutl, communicated to the British Association, he advises the use of the fumes of muriatic acid for preparing the paper. The vapor of iodine has also been used both by ourselves and Cundell, and had been mentioned to most of the London photographers some time prior to the date of the patent. All these facts may appear to be trifling; but it is not for their importance we take this trouble to mention and insist on the date and the authors of their discovery, but we wish the principle to be more generally recognized, (and in these days of *patent* inventions, *patentees* are so apt to lose sight of it) that scientific matters freely given to the world become the general property of the public, and no system of patent laws should sanction the appropriation of them by private individuals.

93. *Methods of rendering the glass more sensitive.*—It has been mentioned by M. Blanquart Evrard that the fluoride of silver forms a very sensitive coating for the glass plates. This substance has already been proposed as a photographic material. It was used very successfully by Robert Hunt in his fluorotype on paper (§70), and was suggested by Sir John Herschell for glass upwards of ten years ago. Its mode of application to the albumenized plate is as follows:—Take the whites of several eggs, and dilute with an equal bulk of water; to every ounce of this albumen, add fifteen grains of iodine of potassium, and five grains of fluoride of potassium or sodium (fluate of soda); after beating up into a froth, put it into a large glass funnel, and receive the clear liquid in a lipped test glass; now clean a plate of glass thoroughly, first with a little alkali, and subsequently with clean water and a piece of old worn silk; the glass should be constantly breathed upon during the latter part of the cleaning process; otherwise it will have a tendency to become electrical and attract particles of dust: for this reason we ad-

* In this edition we have purposely kept the paragraphs 78 to 82 as they were in the edition published in 1850.

† Vide specification of patent granted to Messrs. Talbot and Malone for certain improvements in Photography. June 1850.

* A popular treatise on the Art of Photography, by Robert Hunt. Griffin and Co., Glasgow.

vise the silk should also be slightly damp; after the plate has been thoroughly cleansed, pour on as much albumen as the glass will hold, move it about slightly until perfectly covered, then pour off the excess at one corner, if sufficient of the albumen be used, all the dust and small particles will rise to the surface, and float off when the excess of liquid runs from it; allow the plate to drain for a moment or two, removing the drops by passing the fingers along the edge; now lay it in an horizontal position in a hot air chamber, (a common oven does pretty well, but the plate is apt to get spotted with dust on opening and shutting the door, from its proximity to the fire); as soon as it is quite dry it may be preserved for the next operation, that of rendering it sensitive to light. It may be here observed, that it is not necessary to expose it to a high temperature for the albuminous film is not coagulated or rendered any more insoluble: by this means a temperature sufficient to drive off the water is all that is necessary.* When we wish to take a picture, the prepared plate should be plunged suddenly into a solution of aceto-nitrate of silver, containing eighty grains of nitrate of silver in one ounce of distilled water, two drachms of acetic acid being subsequently added; after a second or two it must be taken out of the solution, and washed in distilled water, as much of the water shaken off as possible, the back dried with bibulous paper and then placed in the camera. The image may be developed by pouring over it a mixture of equal parts of the ordinary aceto nitrate of silver and solution of gallic acid. It will sometimes be one or two hours before it becomes sufficiently intense, and is fixed in the usual way.

The method we have described is only applicable when the the glass is used immediately; if we wish to keep it for any time after it is made sensitive, it should be allowed to get perfectly dry (which will take some hours) before it is placed in the camera slide; this is sometimes troublesome and inconvenient. We have found that the drying is much expedited by passing the plate into alcohol after it has been washed in water; the great affinity strong alcohol has for water dries the plate in a few minutes, as the alcohol takes but a short time to evaporate.*

94. The fluoride of potassium may also be used when the plate has been previously impregnated with the iodide of silver as described (§ 79). In exciting this plate we should wash its surface by the aid of a soft brush with aceto nitrate of silver (twenty grains to one ounce of water); then rinse it in distilled water, to which a few drops of solution of floride of sodium or potassium has been added, and put it at once in the camera.

95. There are several other methods of obtaining very sensitive glass plates. By using pyro-gallic acid, as proposed by Mr. Archer, we obtain a surface very sensitive to luminous influence; he has not published his method of applying it to glass, but we find the following to be a very successful plan. Prepare an albumenized plate by the method given at § 87, with the iodide of silver alone, allow it to dry, then dissolve in one ounce of pure acetic acid 10 grains of nitrate of silver; in a separate bottle, put another ounce of acetic acid, to this add about five grains of pyro-gallic acid; now mix in equal volumes a small quantity of each of these solutions, pour it on the glass plate, spread it with a small piece of bibulous paper, shake off the excess, and use it immediately; it is exceedingly sensitive. To develop the picture, pour on to the plate a similar mixture used to excite it, a beautiful impression will be the result, being both positive and negative, the difference in character depending upon the way in which it is seen. These give much more intense positive pictures than can be produced by gallic acid.

96. An already iodized plate is also made exceeding sensitive by an extremely diluted ammonio-nitrate of silver. If we pour over an iodized plate (§ 87) a recently

* It is curious that we may expose albumen when in a thin film to any temperature without coagulation; this fact has not been noticed, and in directions for producing glass pictures, we constantly find it stated, that it is necessary to expose a plate to a heat of 212 deg., under the impression that it will coagulate the albumen and render it less soluble.

* In experimenting with other films than albumen, alcohol may be objectionable; if the plate be put into a well-closed box, having at the bottom a little fused chloride of calcium, it is very quickly dried.

made solution of ammonio-nitrate of silver, containing about five grains of nitrate to one ounce of water, and then wash it well in distilled water, it is extraordinary sensitive; the picture may be brought out by gallic acid, or better by the pyro-gallic acid mixture, described in the last paragraph (§ 95.) We have frequently obtained pictures in five seconds by these means, and believe, by varying the proportions, it may be done in sun light instantaniously.

97. *Method of converting Negative Photographs into Positives.*— In Mr. Hunt's valuable researches on light, he has mentioned that if we immerse an ordinary photograph on paper into a solution of corrosive sublimate it will entirely vanish, but may be restored at pleasure by a solution of hypo-sulphate of soda. Now, this disappearance arises from the conversion of the dark shadows of the picture into a white powder, which is deposited in the pores of the paper, and is not distinguished from the white around (see also § 35); an apparently black surface is, therefore, obtained; on glass the effect is somewhat different. When a negative on glass is put into bichloride of mercury (corrosive sublimate), all the black immediately disappears, and is replaced by a white powder; when the plate is taken out, washed in distilled water, dried, and laid upon a black surface, a most beautiful positive picture is obtained, quite permanent, and unacted on by light. Should we wish to convert it into a negative again, it is only necessary to pass it into a solution of hyposulphite of soda, and wash and dry it, when it will again assume an intense black appearance; by these means it is possible to have a positive or negative at will. We have often found that after the negative is restored by the hypo-sulphite, stains, which may have almost rendered it useless, have disappeared, and in general a much brighter print from it has been produced. In fact, the combinations on glass are so numerous, that it is unnecessary to detail them, believing that any person who experiments in this beautiful subject, may by looking over the published papers of Sir John Herschel, Mr. Hunt, M. Becquerel and others, on the action of light on paper impregnated with various photogenic materials, easily devise useful modifications and additions to our present knowledge of photography on glass plates, at the same time we should be sorry for each little alteration from the paper to the glass to be made the subject of a *pate t monoply.*

ANTHOTYPE.

98. This is a general name given to those methods of producing pictures, in which the colored juices of plants are the photographic agents; nearly the whole have been described by Sir John Herschel. The petal of the flowers should be crushed in a marble mortar and the juice expressed by squeezing the pulp in a clean cloth. It should then be spread upon the paper with great care, so as to be perfectly uniform all over, and then dried by spontaneous evaporation. It is better to add a little alcohol, as it prevents the paper from becoming changed by the air, which sometimes occurs very quickly when the precaution is not taken. The following are some of the results which are mentioned by Sir John Herschel: †—the flowers of the *Corchorus japonica* impart a fine yellow color to paper, and, upon exposure to sunlight, in about half an hour it is rendered quite white.

Common Ten Weeks' Stocks.—Papers prepared with the alcoholic extract of this flower are of a very bright red, and are sensibly decolorated in a few hours. The Red poppy, *Papaver rhœas*, gives a very beautiful red color, which is speedily bleached by the light, giving a positive picture.

If tincture of turmeric be spread upon paper, it is slowly acted upon; if slightly browned by an alkali, it is a little more sensitive. The *Viola odorata* gives to alcohol a rich blue color, which is pretty rapidly bleached by light. The juice of the *Mimulus Smithii* gives a yellow color, which is discharged by sunshine. The *Ferrarea undulata*, a dark brown flower, yields a juice which, if spread upon paper and exposed to light, turns to a blue. The French marigold, *Tagates patula*, imparts a color to paper which passes rapidly from a brown to a green. We have lately found that the infusion of saffron in water washed over paper is very sensitive to light, the

† On the action of the rays of the solar spectrum on vegetable colors.—*Philosophical Transactions*, 1842.

paper is quite bleached by strong sunshine in about ten minutes. Sir John Herschel, in his paper, enumerates a great number of other flowers, the colors of which are modified or discharged by light; he also gives the result of his experiments with them when acted on by the different colored rays of light; he shows that the most active rays of the solar spectrum in discharging these vegetable tints are those which are *complimentary* to the colors themselves: thus the yellow ray of the spectrum will speedily discharge vegetable blue or purple, but will act very slightly upon yellow or orange, whilst the indigo and blue rays will speedily discharge these colors. It is worthy of remark, *en passant*, that the ordinary argentine photographic papers are most acted on by the *invisible rays* accompanying solar light (§ 5.); but those anthotypic preparations are only affected by the *colored* rays of the spectrum.

Dr. Draper and Mr. Hunt have followed out this subject in its more extended view, viz.; the action of light upon plants, but they appear to differ in many of their results, probably owing to the difference of the light they operated with, one living in England, the other in America. Mr. Robert Hunt placed seeds under different colored glasses; these seeds were found by him to *germinate* under the yellow glass, but were not found to live and flourish; however, if removed, after germination, and placed under the blue, they grew and were very healthy. Mr. Hunt has been commissioned by the British Association to pursue this subject. From the investigations of this gentleman, it is certain that the whole of the carbon of a plant, and which constitutes the greater part of its solid matter, has been derived from the atmosphere in which it exists united with oxygen and carbonic acid. This carbonic acid is decomposed by plants, when under the influence of light, into carbon and oxygen gas; the plant assimilates the carbon, and forms it into organized matter, and oxyen is liberated. Now this occurs just according, and in proportion, to the amount of light, or rather, to the quantity of actinic power existing at the time; for it has been shown, that under yellow, green, or red glasses, plants grow but very imperfectly; or, in other words, they are unable to decompose the carbonic acid, in consequence of the absence of the chemical or blue rays. Every person must have noticed the sickly appearance of vegetation, if grown in a place where light is partially excluded; the leaves are nearly white, and if the plant does flower and bear fruit, the leaves are pale and scentless, and the fruit insipid. We have familiar examples of this when the gardener wishes to bleach celery or endive; he covers up the plants with earth, light is excluded, and they become quite white; the interior of a cabbage is white, and for a similar reason. These are interesting facts, for they show how mutually dependent animals and plants are on one another. It is absolutely essential to animal life that the requisite quantity of oxygen should exist in the air, which myriads of animals are continually abstracting, in order to keep up a process of combustion, the product of which is carbonic acid; for on inhaling the oxygen from the air, it becomes with the carbon contained in our bodies, and forms this noxious gas, which is exhaled, and deteriorates the atmosphere. Now, under the influence of light, this carbonic acid is decomposed by the vegetable kingdom, and pure oxygen gas set free, to be again absorbed by animals. In the words of Mr. Hunt, "It is not possible to conceive a more perfect or more beautiful system of harmonious arrangement than this. If the vegetable world was swept away, animal life would soon become extinct; and if all animal existence was brought to a close, the forest would fall, and the flowers of the field, which now clothe the earth with gladness, perish in the utterance of a lamentable decay."

We have now conducted the reader through some of the most important and useful of the photographic processes on paper, and refer him to the second part of this work for a description of the Daguerreotype, Thermography, and other processes with metallic plates.

From the London Art-Journal.

LIGHT IN PICTURE GALLERIES.

SIR,—Having observed a paper in a recent number of the *Art-Journal* by Mr. C. H. Wilson, "On the Lighting of Picture and Sculpture Galleries;" I beg to offer a few additional observations on this important subject. The plan advocated by Mr. Wilson has recently been adopted in the gallery of the Louvre, in Paris; and with such excellent results as must necessarily impress every one familiar with the previous arrangement of that gallery, with a sense of the immense advantages of the new mode of lighting.

Formerly the Louvre was a complete chaos, so far as concerned its contents; the pictures were hung without system or selection, and great numbers shrouded in complete obscurity;—under recent management, however, many improvements have been effected. The celebrated long gallery to which I would particularly refer, and which contained the most important pictures of the collection, was formerly very unequally and inefficiently lighted: it is divided, as many of your readers are aware, into three lengths or divisions, which, from having apparently been constructed at different periods, have induced certain changes and modifications in the architectural detail of the gallery both inside and out: of these, the centre portion was formerly the worst off for light, being lighted from low side windows deeply recessed in the massive wall; the two other divisions were better supplied, but still only imperfectly, from skylights on both sides of the semi-circular vaulted ceiling; these latter divisions remain much as before, although important ameliorations have been effected in other respects; but the centre portion was a sort of cellar, and the pictures it contained all but visible; it is here that the new plan has been introduced. It is impossible to imagine a greater change than that now produced; indeed, the whole aspect of the gallery is altered by it; standing at either end, one is forcibly struck with the greater volume and purity of light in this part, as compared with the other two divisions; indeed, the pictures are scarcely to be recognized again, even by those who were formerly in the daily habit of regarding them; there is now no obscurity, no glare, none of that indistinctness or confusion of light which was formerly destructive of all unity of effect; all now is calm, lightsome and distinct; the mind has leisure to drink in the full meaning of each work, undisturbed, as formerly, by the thousand drawbacks, which disposed one to pass on and forego the effort, rather than fatigue the eye and temper in the vain attempt to see.

I have recently returned from a tour on the continent, having, during the course of it, visited nearly all of the most famous galleries in Italy; and I can safely say I have not seen one in which the lighting is not more or less deficient; in some, both arrangement and lighting must have been dictated by stupidity itself; everywhere in Italy one is disappointed and annoyed from this cause. How much we lose of the glorious frescoes that everywhere abound, from the universal obscurity in which they are enveloped; it is not too much to say that in nine cases out of ten the noblest works are "things not seen," but rather guessed at—half imagined—in fact, Mr. Ruskin's "Lamp of Sacrifice," or some equally obscure luminary, would seem to have been their guiding light; certainly light for human eyes can very rarely have been calculated upon. The churches of Italy at the present day, are the dark mouldering sepulchres of Art; perhaps I am digressing in alluding to them, but whether a noble work of Art exists in a gallery or a church, the evil is the same if it be sacrificed to continual gloom; and against this it is the duty of every artist to enter his protest. Who, for instance, can really be said to have *seen* our own greatest picture, Sebastiano's "Raising of Lazarus," placed in the so-called gallery? Who, on the other hand, has retained any adequate impressions of Titian's "Peter Martyr"—

placed high up on a trumpery bedecked altar, exposed to the mildewing blights of a damp sea breeze from ever-opened portals; blackened and fumigated with filthy incense; lighted from above, beneath, around; from every quarter that can give an extra glare upon its surface! Such instances are, alas, innumerable; they are, indeed, in the present state of universal ignorance and apathy that attends this subject, rather the rule than the exception. There is one serious evil, too, attending the ill-lighting of works of art, which is seldom taken into account—*obscurity is neglect.* "Out of sight out of mind:" hence deterioration and decay;—in the dark or crowded gallery; the dry arid surface, the damp and mildewed canvas, the opening panel may crumble, split, and moulder, unobserved. In the dark church the intonaco may blister, scale and effloresce; ignorance and carelessness may deface, and blacken with impunity. Mr. Wilson has remarked upon the loss which statuary suffers from injudicious lighting; I would instance, if it were not too far trespassing upon your valuable space, the strange fate in this respect that has attended many of the finest works of Michael Angelo; and, to begin with those nearest home, it may not be generally known that there exists two of his very finest statues no further off than Paris: these are two of the Slaves, or Caryatidæ, executed for the monument of Julius II. I shall never forget the thrill of wonder and admiration with which I first saw these figures years ago, the more so as they came upon me with all the novelty of a discovery; they were, at that period, placed in an obscure apartment, on the ground-floor of the Louvre, opened only on Sundays, inaccessible to students, unknown to the majority of visitors, and lighted from a range of side windows, whose confused and flickering lights effectually subdued all their wonderful *finesse* of surface into mere monotony. I am not aware whether this arrangement has been superseded; I should hope the absurb position has not escaped the intelligent notice of the new authorities. The remaining two of this series I have recently found out in the famous Boboli Gardens at Florence; dimly visible at the bottom of a hideous erection of stones, shells, and trumpery, misnamed a grotto; moss-grown, battered, damp, half-embedded in rough cast, and surrounded with a childish mosaic of pebbles and spars. In the Florence Gallery are his "Bacchus," "Adonis," and little "Apollo;" and in the same lost corner with these, for they all share the same fate, is Baccio Bandinelli's copy of the "Laocoon," Donatello's "St John," and Sansovino's "Bacchus," all very notable works; they are placed together at the end of one of the long galleries, lighted by one window at the end, and a range of low side lights, the effect being perfect nullity, conflicting shadows in some portions, a blank diffused half-shadow in others, whilst the discolorations of the marble exaggerated in the uncertain light. effectually destroy all mass or *ensemble.*

At the Palazzo Vecchio his group of "Victory" is lost to all intents and purposes in a demi-twilight. At the Academia his half-finished "St. Matthew," is placed under an exterior arcade, in a continual shadow, except, perhaps, the lower part, which is sometimes cut across by brilliant sun-light. But in worse plight than these even, are his two famous "Pietas," in the Duemo of Florence, and at St. Prter's in Rome; the former is placed behind the high altar, perhaps the very darkest place in this very dark church; there is no direct light of any kind upon it; all one can see of it, beyond its dark mass, being the tinsel and trumpery with which they have bedizened the neck and bosom of the sorrowing Mother: at St. Peter's his well-known group is lifted up some twelve or fifteen feet above the eye, amidst a heap of glaring marbles and mosaics, impossible to be seen sufficiently near without complete and hopeless foreshortening: in every case, the exquisitely modelled torso of the Christ is completely lost; whilst the light is that dreary dim difusion, which blends flesh and drapery, muscle, bone, and tendon, deep cuttings and prominences, all in one monotonous uncertainty.

I remain, sir, your obedient servant,

J. C. Robinson.

Sept. 15*th*, 1851.

GOSSIP.

IN entering upon the new year in the publication of a periodical neither the publisher nor editor—generally speaking—feels that want of confidence in its success that harrasses him at the outset, for upon the success of the first year depends that of the second. We have watched the rise and progress of a great number of these literary and scientific efforts in our day and we have found—almost without exception—that those which have been enabled to *sustain themselves*, by the patronage they received for a twelve month are sure to do so for years—or as long as the object or principle for which they have been established requires their influence.

Now we know that the science of Heliography is by no means perfect, and it is safe to calculate that years will yet transpire before it will become so, notwithstanding so many of our Daguerreans flatter themselves that they have arrived at the acme of their art. For one we cannot see how any person engaged in the business and who aspires to the consideration of an intelligent and sane man can for a moment entertain the idea that his art is now incapable of improvement. Yet we are constrained to say that many of this class are to be found among Daguerreotypists. We have frequently alluded to them before, and it was our hope that a year's experience would prove to all of this way of thinking, how egregiously they were mistaken; but our hopes have in some cases been disappointed, and that too where they were most strongly placed. In the majority of cases, however, we find that opinions have changed, and some of those who ridiculed in the strongest terms the idea of teaching our Daguerreans new things, are now most zealous in advocating the necessity of instruction.

It is not many weeks since we had a long conversation, with one of our subscribers, on the art; in which he still advocated his old position, that it was impossible to teach him anything concerning it, as he was fully conversant with every phase. He had been previously making various complaints of the many difficulties he experienced in operating—and we must say, *en parenthesis*, that he is not, in reality, a good operator, there being scarcely a point of excellence he does not often fail in.

After questioning him on several prominent points in the art, and making up our mind that he was a mere mechanic in the business, we enumerated several articles by different practical Daguerreans of this country, or translated from the French, bearing more or less upon the very difficulties of which he complained, and inquired if he had studied and applied them. His answer was—

"Oh! no, I never read them."

"And why not?" we asked.

"Oh; what's the use?" he said, "these recipes and directions we find in books are generally so vague and incorrect that they never amount to anything. I never heard of their being of any use."

"But if you never applied them, how are you capable of judging of their worthlessness?"

"Why, those who have tried them say they are so."

"Well, suppose they have said so; do you know that they are men capable of understanding the nature and effects of the information conveyed in what is written? Are they, themselves, good practical operators?"

"As to the first part of your question, I cannot judge rightly. They appear to be persons of good common sense, although not over well educated, As to the second, I really do not think they can take as good pictures as Mr. Gurney, Lawrence, Brady, Morand, Beckers, or myself"

"Then you are content to place such a man's judgment against those, who are, not only better educated—whose education in most instances extend to every branch of art and science—but better practiced in the art,— as well as against your own. You are content to follow entirely the instructions you first received—a mere mechanical instruction—attributing your failures to causes entirely beyond the control of man, rather than relinquish a foolish opinion on the present perfection of your art. You prefer plodding along, submitting to, or cursing the difficulties that daily cross you in your operations, rather than believe that you can receive instructions from the experience of others. You prefer pronouncing the published experiments of men of science, who labor unceasingly to discover and promulgate the means of overcoming your difficulties, humbug, to even an attempt at ascertaining their truth. Is this sensible; is it reasonable, and is it just?"

"Well, I don't know; but you know experiments are expensive, and I don't think it pays to meddle with them."

"True, they are expensive; but if you were even obliged to try experiments, and one cost you five or ten dollars, would not the money be well laid out, if in the course of the year you saved one or two hundred in the loss of time and pictures? Fortunately, however, in the case of which we are talking, *experiments* are needless; they have been already made by others, put into practical use by them, and when found satisfactory, given to you through the columns of our Journal at a mere nominal price—considering the number of facts given the price is not worth calculating in the year's expences—and you have nothing more to do than follow the instructions implicitely. Nine-tenths of the failures arising in the application of new discoveries or recipes, and which you, and others of the same way of thinking, call *humbugs*, are owing entirely to carelessness in following the instructions given by the discoverer."

"That may be so, but Mr. —— who tried Mr. Hesler's process of cleaning, buffing, and coating the plate, as published in your Journal, says he followed his instructions implicitely, and that they will not give the results he claims, and that like all other published recipes, this is good for nothing—that some part of it as practiced by Mr. H. himself—and which alone would ensure success—must have been kept back by him for fear that others would rival him."

"We are sorry your friend should possess such a mean spirit as to attribute so dishonorable an action to any one. We are afraid he has judged Mr. Hesler by himself. There is nothing that has given us more cause for regret than the bitter envy that has (more than now) and does exist among Daguerreans, and there is no obstacle that presents so great a bar to the improvement of the art in the United States as this pitiful feeling. We know, moreover, that your friend is mistaken, for Mr. H. is too honorable ever to put such a trick upon his co-laborers, and too sensitive to his own reputation. We have seen pictures taken by his process, and can say without fear of contradiction, they are not to be excelled by any living Daguerreotypist. Others, also, have since successfully practiced the process, and you may depend upon it, your friend is not a man sensible enough to teach you or guide your judgment. We do not see, entertaining the

ideas you do, why you take the Journal."

"Oh!" said our sub., laughing; "I only take it to keep *posted up* in what is going on. I only read the Gossip."

"We are much obliged for your partiality," said we; "but you would please us better if you would also read those portions devoted to the more practical portions of your art, for we feel assured that you would be very materially benefitted by doing so."

We parted mutually friendly, but—although he still takes the Journal—we fear he is incorrigable. No improvements to be made in the art! Why, there is not a week passes in which there is not something worth knowing made public.

We present in the present number a discovery made by Dr. Dorat, invaluable to the Daguerrean artist. He assures us it is a perfect antidote to scum under all circumstances.

Look at the photographs of the present day and compare them with those taken only one year ago. Read the article of M. Wey, in the present number of our Journal, on the instantaneous productions of M. Macaire—read M. Blanquart Evrard's Treatise on Paper Photography—read the debates of the Heliographic Society of France—read all that appears on the art attentively, and when any thing treats on the branch you are pursuing, practice it thoroughly—and then say, if you can, that no improvements are made in Heliography. For men whose minds are untrammelled by a single hour's study into the secret principles of their art, to give an opinion as to the utility of any new process, and that too before reading, is most absurd and ridiculous. To pronounce those who, after patient research for months and years, give new experiments and discoveries to the world, *humbugs*, is foolish, and merely shows the ignorance and narrowmindedness of him who speaks the word.

We know that "*humbugery*" is rampant at the present age, and people of every degree swallow it with a relish, but it is a bug easily digested, and like the advertisements of a quack doctor will betray itself, whatever form it may assume.—Therefore, when we hear a man apply *humbug* to everything new—particularly when he confesses he has not examined into the merits of the case—we set him down as an ignoramus of the deepest dye.

Our remarks must not be understood as applying to the mere theories of those visionaries who conceive improvements, and reasoning from analogy put them forth as fixed facts, without having first submitted them to practical experiment. These kind of theories generally begin with an if and end with if, and are as apt to gore the farmer's as the judge's bull.

It requires very little discrimination to detect these from the actual improvements of the practical man. There is no hesitancy on the part of the true discoverer to prove his theory by exhibiting the actual results. We never knew or heard of but one man who had the assurance to ask the whole world to believe him implicitly, and he stretched its credulity till it snapped, and left him floundering in a deep pit of ignominy. Such are not, however, humbugs; they are the offsprings of diseased imaginations, and always—as we said before, in regard to humbugs—sooner or later, betray themselves by the over-wrought and far-fetched reasonings and arguments in which they are clothed.

—We have re-published, by request, the letters from A Practical Daguerre to the Philadelphia *City Items*. The reasonings, in the main, of these letters are just and worthy of the reflection of every one who has suffered his wishes to run off with his judgment. We thought, on first perusal, we should review certain portions,

with which we disagreed, but on reading them a second time, and comparing them with facts before us, and our own memory, we do not feel disposed to be hypercritical, or rather to appear so.

We think, however, he is mistaken in the severe censure he casts upon those who were instrumental in confirming the assertions of the discoverer. They were—like hosts of others—deceived by their own hopes, and the excellent character borne by the discoverer in his own vicinity, and we have no right to impugn their motives, or place them in a false position. They were mistaken and that is all.

We also think the writer goes too far in calling the Hillotype an imposition, for we have not the slightest doubt that Mr. Hill at the time of his announcement sincerely *believed* that he had made the discovery, and still *hopes* that he has. Mr. Insley, of this city produces all the colors on the plate, in the form of a halo around the head—others have accidentally produced from one to four colors and tints, which has led them to believe they had made a discovery.—Daguerre himself succeeded in impressing natural colors by his process, and various other experimentalists have done the same, all, however without any practical benefit. Some event of a nature like these enumerated may have happened to Mr. Hill, and caused him to believe he had arrived at the grand secret, and by hastily announcing it as a certainty, he got himself into a predicament both inextricable and unenviable. We pity Mr. Hill, but we cannot censure or abuse him.

— We have, inadvertantly omitted to mention before that Mr. Knapp has opened a very elegant suite of rooms at the Alhambra in Broadway, where his improved facilities gives him an opportunity of proving to his friends that he is determined to render justice to all who favor him.

— Mr. Gurney informed us the other day that he received one hundred and twenty dollars for pictures taken the day previous, entirely by himself, before three o'clock, and this too at a dull season. Truly the people know how to appreciate fine pictures—and know where to get them. Mr. Gurney deserves all the encourgement he gets, and we trust he will continue to receive this substantial acknowledgment of his talent.

— Mr. Morand has also changed his quarters since our last, and now occupies his new rooms opposite Chambers street in Chatham. We copy the following from the Sunday Courier:—

Removal of the Morand Daguerrean Gallery.—This establishment has been constructed expressly for the Daguerrean art, and is second to no other gallery in the United States for the artistic arrangement of light, and also possesses other facilities, both in the chemical and mechanical department, that are unsurpassed. The "Reception Room" has been fitted up expressly with a view of rendering every convenience to ladies and children. We also understand that Mr. Augustus Morand, who has for many years stood among the first artists in his profession, will attend personally to taking every picture. The public should call and examine this beautiful establishment.

By the by, our attention has been called to an article in a certain semi-monthly advertising sheet, in which it is asserted that A. Morand, Esq., President of the New York State Daguerrean Association, never signed the Constitution. We have the *original* document now before us, and his name is *third on the list and marked paid.* Humph! what a wry face that falsehood must have caused.

— The Advertiser, at Galena, Illinois, states that a Mr. Hesler has finished a picture for a gentleman in that city, in which the metallic appearance of the plate is

wholly destroyed, and its place supplied by a background as agreeable to the eye as pure India paper. At first glance, says the Advertiser, the picture looks like a fine line engraving, but the second shows you that there is—if not a grace—a delicacy of touch and pencilling beyond the reach of art. This picture, unlike any other Daguerreotype the editor of that paper has examined, can be seen, like a painting or a drawing, from any angle, the metallic tints being, as has been said before, destroyed.

The Messrs. Mead Brothers desire us to announce the following subscriptions towards the erection of a monument to the memory of Daguerre and Niepce in France.

Mead Brothers,	N. Y. city,	100	francs.
E. Anthony,	"	100	"
J. Gurney,	"	50	"
P. A. J.,	"	20	"
R. H Vance,	San Francisco,	50	"

The subscription to the monument to Daguerre, voted by the New York State Daguerrean Association, to be erected in New York city, we are afraid will prove a failure. The committee appointed to solicit donations do not appear to be very active.

— We would recommend to our western friends a visit to the establishment of Mr. A. T. Earle of Cincinnati, Ohio, whose advertisement will be found on the cover. His institution is an excellent one, and will most undoubtedly meet the wants of all those for whom it has been instituted. Mr. Earl's connection with the western Art-Union gives him facilities for instructing in the important branch of position seldom possessed by an artist.

— The Brothers Mead are doing a fine picture business, and giving their customers all the satisfaction desired. They deserve great praise for the active part they have taken to promote the erection of a monument to Daguerre and Niepce in France. We would ask, however, where is that address? A little fairy answers, been so busy have not had time to attend to it, but you shall have it in a day or two. *Tresbien.*

— Messrs. Beckers & Piard make very little noise about their Daguerreotypes, but everybody knows the adage about "modest merit" and act accordingly. None are more deserving of liberal patronage than this firm, and we rejoice to learn that they are most liberally patronized.

Our Daguerrean Album.—We have received several communications in regard to this work. We will state for the information of all that those artists who wish to contribute to the work must send us their Daguerreotypes before the first of May next. Our publisher intends to put forth the work. He has made a liberal offer to the Daguerreotypists of our country and those who do not choose to avail themselves of it will have no cause to complain when they find those who have reaping a harvest they cannot secure. Our publisher will bring the work out and if his offer is not accepted by our artists he will employ a single one of unquestionable reputation whose name alone will be appended to the work. We have nothing to do in the matter but to place the fact before our Daguerreotypists, and we must not be censured if they are hereafter dissatisfied with the result of the measure. We wish to see as many as possible represented, and would recommend all who can to contribute, for it would give us pleasure to show to the world how many talented operators we have in this country. In case it is not got up according to the first proposition—we are requested to say —the price of the volume will be Fifty Dollars.

— We copy the following interesting communication from La Lumiere.—

"The Mission of M. Place.—Towards the close of last September, the Journals announced the departure of M.

Place, appointed Consul of France to Mosul, and intructed with the superintendence of fresh excavations upon the site of ancient Ninevah. A scientific Committee composed of a distinguished philologist, architect, and an old French Consul in Syria, perfectly acquainted with this country, aids M. Place in his researches, and in exploring Assyria, Mesopotamia, Babylon, Chaldea, and Media.

"Still later, the 12th of October, the Lloyds announced the arrival of MM. Place and Tranchaut at Athens, where they commenced to reap the benefits of their interesting voyage by examining Grecian antiquities.

"In a scientific and artistic point of view, these curiosities possess a great importance. Every one knows that interesting traces of civilization are left in thi corner of Asia, at present almost deserted; we are aware how much wealth has been buried under the accumulated dust of generations, and how many of the most interesting chapters it has contributed to history. Surely, in a couple of years, when this Committee shall have finished its work of exhumation, and shall return, loaded with the relics of these great cities, the wonders of which have been themes for conversation for the last three centuries, they will afford a rich harvest for archeologists, artists, *savants*, historians and philosophers. But the youthful art of photography is destined to illustrate with still greater reality and beauty what journalists have been unable to describe with sufficient minuteness.

"M. Place has provided himself with everything requisite for his enterprise, in order to to take photographic proofs upon the spot itself of his researches, and comprising every necessary up to the present time. We will here give a rough schedule of chemical agents with which he furnished himself prior to his departure.

Nitrate of Silver,	3 Kil.	500 gr.
Gallic Acid,	1 "	
Acetic Acid,	2 "	
Hyposulphite,	25 "	
Iodide of Potassium,	4 "	

Also alembics, basins, etc., etc., in ssfficient number. This shows that the new consul intends to bring back a large number of proofs. Indeed by describing these ancient rivers—noble by the glory of antiquity—flowing between the crumbling ruins of decayed palaces, temples overturned, and shattered idols—how often will the traveler have occasion for this simple apparatus, by means of which these sites, inhabited by nations now no more, can be reproduced on paper or glass in a few seconds, and by the aid of that sun which having illumined these empires, also shines upon these ruins! We may safely say that M. Place will bring home in his cartons Assyria herself, to present her to the savants, artists, and all those who seek to examine. ERNEST LACAN."

— We would call attention to our prospectus on the cover. Apart from the value of the Journal to every artist, we offer strong inducements to new subscribers. We shall endeavor to fulfill the conditions therein laid down faithfully, and we trust our friends will use their endeavors to increase our circulation. We have always heretofore been the first to present to the Daguerreotypists of the United States, all new discoveries made in the art, and it is no idle boast in us to say that we have been at greater expense in doing so than any similar journal, and we must look to the liberal and enlightened portion of our Daguerreotypists for an adequate support. We have had little to complain of in this respect during the first year, but we trust in a further increase in our subscription list to enable us to continue to improve. Shall we be disappointed?

THE

PHOTOGRAPHIC ART-JOURNAL.

Vol. 3. FEBRUARY, 1852. No. 2.

THE POETRY OF SCIENCE, OR STUDIES OF THE PHYSICAL PHENOMENA OF NATURE.*

BY ROBERT HUNT,
Author of 'Panthea,' 'Researches on Light,' etc.

IN seeking for a cause, writes Sir David Brewster, which is capable of inducing magnetism on the ferruginous matter of our globe, whether we place it within the earth, or in its atmosphere, we are limited to the SUN, to which all the magnetic phenomena have a distinct reference; but, whether it acts by its heat, or by its light, or by specific rays, or influences of a magnetic nature, must be left to future inquiry.

We have learnt that magnetism is not limited to ferruginous matter; we know that the ancient doctrine of the universality of the property is true. Kircher, in his strange work on Magnetism published in the early part of the seventeenth century—a curious exemplification of the most unwearing industry and careful experiment combined with the influences of the credulity and superstitions of his age—attributes to this power nearly all the cosmical phenomena with which, in his time, men were acquainted. He curiously anticipates the use of the supposed virtue of magnetic traction in the curative art; and as the titles of his concluding chapters sufficiently show, he was a firm believer in animal magnetism. But it is not with any reference to these that we refer to the work of *Athanasii Kircheri, Societatis Jesu, Magnes, sive de Magnetiva Arte*, but to show that, two hundred years since, man was near a great truth; but the time of its development being not yet come, it was allowed to sleep for more than two centuries, and the shadow of night had covered it. In speaking of the vegetable world, and the remarkable processes by which the leaf, the flower, and the fruit are produced, this old sage brings forward the fact of the dia-magnetic character of the plant, which has been, within the last two years, re-discovered; and he refers the motions of the Sun-flower, the closing of the Convolvulus, and the directions of the spiral, formed by twining plants, to this particular influence.

This does not appear as a mere speculation, a random guess, but is the result of deductions from experiment and observation. Kircher doubtless leaped over a wide space to come to his conclusion; but the result is valuable in a two fold sense. In the first it shows us that, by neglecting a fact which is suggestive, we probably lose a truth of great general application; and secondly, it proves to us, that, by stepping beyond the point to which inductive logic leads, and venturing on the wide sea of hypothesis, we are liable to sacrifice the true to the false, and thus to hinder the progress of human knowledge.

Magnetism, in one or other of its forms, is now proved to be universal, and to its power we are disposed to refer the structural conditions of all material bodies, both organic and inorganic. This view has scarcely yet been recognised by philosophers; but as we find a certain law of po-

* Continued from vol. 3, No. 1, p. 20.

larity prevailing through every atom of created matter, in whatever state it may be presented to our senses, it is evident that every particle must have a polar and directing influence upon the mass, and every coherent mass becomes thus only a larger and more powerful representative of the magnetic unit. Thus we see the speculation of Hansteen, that the sun is, to us, a magnetic centre, and that it is equally influenced by the remoter suns of the universe, is supported by legitimate deductions from experiment.

The great difficulty is not, however, got rid of by this speculation; the cause by which the earth's magnetism is induced is only removed further off.

The idea of a magnetic fluid is scarcely tenable; and the ferruginous nature of the Aurora borealis receives no proof from any investigation; indeed, we have procured evidence to show that iron is not at all necessary for the production of magnetic phenomena. The leaf of a tree, a flower, a fruit, a piece of animal muscle, glass, paper, and a variety of similar substances, have the power of repelling the bar of iron which we call a magnet, and of placing it at right angles to the direction of the force exerted by them. This is a point which must be constantly borne in mind, when we now consider the mysteries of magnetic phenomena.

Any two masses of matter act upon each other according to this law, and although by the power of cohesion the force may be brought to an equilibrium, or to its zero point, it is never lost, and may be readily and rapidly manifested by any of the means employed for electrical excitation.

Reasoning by analogy, the question fairly suggests itself: If two systems of inorganic atomic constitution are thus invested with a power of influencing each other through a distance, why may not two more highly developed organic systems equally, or to a greater extent, produce an influence in like manner? Upon such reasoning as this is founded the phenomenon known as Animal Magnetism. There is no denying the fact that one mass of blood, muscle, nerves, and bone, must, magnetically, influence another similar mass. This is, however, something totally different from that abnormal condition, which is produced through some peculiar and, as yet, unexplained physiological influences.

With the mysterious operations of vital action, the forces which we have been considering have nothing whatever in common. The powers which are employed in the arrangements of matter are, notwithstanding their subtile character, of far too gross a nature to influence the psychological mysteries which present themselves to the observant mind. It cannot be denied that by placing a person of even moderate nervous sensibility in the constrained position, and under the unnatural influence of the mind, as acquired by the disciples of Mesmer, a torpor affecting only certain senses is produced. The recognized and undoubted phenomena are in the highest degree curious—but in these the marvels of charlatanry and ignorance are not included;—and the explanation must be sought for by the physiologist among those hidden principles upon which depends all human sensation.

Man, like a magician, stands upon a promontory, and, surveying the great ocean of the physical forces which involve the material creation, and produce that infinite variety of phenomena which is unceasingly exhibited around him, he extends the wand of intelligence, and bids the "spirits of the vasty deep" obey his evocation.

The phenomena recur—the great processes of creation go on—the external manifestations of omnipotent power proceed—effects are again and again produced; but the current of force passes undulating onwards;—and to the proud bidding of the evocator there is no reply but the echo of his own vain voice, which is lost at last in the vast immensity of the unknown which lies beyond him.

We see how powerfully the physical forces, in their various modes of action, stir and animate this planetary mass; and amongst these the influence of magnetism appears as a great directing agent, though its origin is unknown to us.

That power which, like a potent spirit, guides
The sea wide wanderers over distant tides,
Inspiring confidence where'er they roam,
By indicating still the pathway home;—
Through nature, quickened by the solar beam,
Invests each atom with a force supreme,
Directs the caverned crystal in its birth,
And frames the mightiest mountains of the earth;
Each leaf and flower by its strong law restrains;
And man, the monarch, binds in iron chains.

CHAPTER XI.

CHEMICAL FORCES.

Nature's Chemistry—Changes produced by Chemical Combination—Atomic Constitution of Bodies — Laws of Combination — Combining Equivalents—Elective Affinity—Chemical Decomposition—Compound Character of Chemical Phenomena—Catalysis, or action of Presence—Transformation of Organic Bodies—Organic Chemistry—Constancy of Combining Proportions—The Law of Volumes, the Law of Substitutions, Isomeric States, &c.

All things on the earth are the result of chemical combination. The operations by which the commingling of molecules and interchange of atoms take place, we can imitate in our laboratories; but in nature they proceed by slow degrees, and, in general, in our hands they are distinguished by suddenness of action. In nature, chemical power is distributed over a long period of time, and the process of change is scarcely to be observed. By art we concentrate chemical force, and expend it in producing a change which occupies but a few hours at most. Many of the more striking phenomena of nature are still mysterious to us and principally because we do not, or cannot, take the element time into calculation. The geologist is compelled to do this to explain the progress of the formation of the crust of the earth, but the chemist rarely regards the effects of time in any of his operations. The chemical change which within the fissure of the rock is slowly and silently at work, displacing one element or molecule, and replacing it by another, is in all probability the operation of a truly geological period. Many, however, of the changes which are constantly going on around us, are of a much more rapid character, and in these nature is no slower manipulating than the chemist.

Had it been that the elements which are now found in combination could exist in a free state, the most disastrous consequences would necessarily ensue. There must have been a period when many of the combinations known to us were not yet created. Their elements either existed in other forms, or were uncombined. Our rocks are compounds of oxygen with certain peculiar metals which unite with oxygen so rapidly that incandescence is produced by their combination. Let us suppose that any of these metals existed in purity, and that they were suddenly brought into contact with water, the atmospheric air, or any body containing oxygen, the result would be a convulsion of the most fearful kind; the entire mass of metal would glow with intensity of heat, and the impetuosity of the action would only be subdued when the whole of the metal had become oxidized. Volcanic action has been refered to some such cause as this, but there is not sufficient evidence to support the hypothesis; indeed, the opinion of most philosophers is against it. Such a condition may possibly have existed at one time, but it is only adduced here as an example of the violent nature of some chemical changes. Potassium thrown on water bursts into flame, and sodium does so under certain conditions. If these, or the metals proper in a state of fine division are brought into an atmosphere of chlorine, the intensity of chemical action is so great that they become incandescent, many of them glowing with extreme brilliancy. If hydrogen gas is mixed with this element (chlorine) they unite, under the influence of light, with explosive violence, giving rise to a compound, muriatic acid, which combines with water in an almost equally energetic manner. Nitrogen, as it exists in the atmosphere, mixed with oxygen, appears nearly inert; with hydrogen it forms the pungent compound ammonia; with carbon, the poisonous one cyanogen, the base of Prussic acid; with chlorine it gives rise to a fluid, oily in its appearance, but which, when merely touched by an unctuous body, explodes more violently than any other known compound, shivering whatever vessel it may be contained in, to atoms; with iodine it is only slightly less violent; and in certain combinations with silver, mercury, gold, or platinum, it produces fulminating compounds of the most dangerous character. Here we have elements harmless when uncombined, exhibiting the most destructive effects if their combinations are at all disturbed; and in the other case we have inert masses produced from active and injurious agents.

We regard a certain number of substances as *elementary;* that is to say, not being able, in the present state of our knowledge, to reduce them to any more simple condition, they are regarded as the elements, which by combination produce

the variety of substances found in the three kingdoms of nature.

We have already spoken of the atomic constitution of bodies. It remains now to explain the simplicity and beauty, which mark every variety of combination under chemical force. As a prominent and striking example, water is a compound of two gaseous bodies, oxygen and hydrogen :—

If we decompose water by means of galvanic electricity, we shall find the volume of hydrogen gas to be to that of the oxygen as two to one; and if equal volumes of those gases are weighed, the oxygen will be found to be sixteen times heavier than the hydrogen. Hence we infer that water, which is

Oxygen	100
Hydrogen	12.5

is composed of one atom of hydrogen gas weighing 1, and an atom of oxygen weighing 8, relatively to the hydrogen. It is found in the same way that the theoretical weight of the atom of carbon is 6, and that of nitrogen 14; whilst the atom of iron is 28, that of silver 108, of gold 199, and that of platinum and iridium each 98. Now, as these are the relative weights of the ultimate indivisible atom, it follows that all combinations must be either atom to atom, or one to two, three, or four; but that in no case combination should take place in any other than a multiple proportion of the equivalent or atomic number. This is found to be the case. Oxygen, for instance, combines, as one, two, or three atoms: its combination presenting some multiple of its equivalent number 8, as 16, or 24; and in like manner the combining quantity of carbon is 6, or some multiple of that number. Where this law is not found strictly to agree with analytical results, of which some examples are afforded by the sesquioxides, it may be attributed, without doubt, to some error of analysis, or in the method of calculation.

Nothing can be more perfect than the manner in which nature regulates the order of combination. We have no uncertain arrangement; but, however great the number of the atoms of one element may be, over those of another, those only combine which are required, according to this great natural law, to form the compound, all the others still remaining free and uncombined. These results certainly appear to prove that the elementary particles of matter are not of the same specific gravities. Do they not also indicate that any alteration in the specific gravity of the atom would give rise to a new series of compounds, thus apparently producing a new element? Surely there is nothing irrational in the idea that the influences of heat or electricity, or of other powers of which as yet we know nothing, may be sufficient to effect such changes in the atomic constituents of this earth.

The combination of elementary atoms takes place under the influence of an unknown force, which we are compelled to express by a figurative term, *affinity.* In some cases it would appear that the disposition of two bodies to unite, is determined by the electrical coudition; but a closer examination of the question than it is possible to enter into in this place, clearly shows that some physical state, not electrical, influences combining power.

Chemical affinity or attraction is the peculiar disposition which one body has to unite with another. To give some instances in illustration, water and spirit combine most readily: they have a strong affinity for each other. Water and oil repel each other: they will not enter into combination. If carbonate of potash is added to the spirit and water in sufficient quantity, the water is entirely separated, and the pure spirit will float over the hydrated potash. If potash is added to the oil and water, it combines with the oil, and, forming soap, they all unite together; but, if we now add a little acid to the mixture, the potash will quit the oil to combine with the acid, and the oil will be repelled as before, and float on the liquid. This has been called single elective affinity. These elections were regarded as constant, and chemists drew up tables for the purpose of showing the order in which these decompositions occur. Thus, ammonia, it was shown, would separate sulphuric acid from magnesia, lime remove it from ammonia, potash or soda from lime, and barytes from potash or soda. It was thought the inverse of this order would not take place, but recent researches have shown that the results are modified by quantity and some other conditions.

It often happens that we have a compound action of this kind in which double election is indicated. Sulphate of lime and carbonate of ammonia in solution are brought together, and there results a carbonate of lime and sulphate of ammonia. Now, in such cases nothing more than single elective attraction most probably occurs, and the carbonic acid is seized by the lime, only after it has been set free from the ammonia, by the great affinity of that earth for carbonic acid: and then, by the force of cohesion acting with the combining powers, the insoluble salt is precipitated. There is a curious fact in connection with this decomposition. If carbonate of lime and sulphate of ammonia are mixed together dry, and exposed, in a closed vessel, to a red heat, sulphate of lime and carbonate of ammonia are formed. These opposite effects are not very easily explained. The action of heat is to set free the carbonic acid; and it can only be by supposing that considerable differences of temperature reverse the laws of affinity, that we can at all understand this phenomenon. That different effects result at high temperatures from those which prevail at low ones, recent experiments prove to us, particularly those of Boutigny already quoted, when considering decomposition by calorific action.

Under the term chemical affinity, which we regard as a power acting at insensible distances, and producing a change in bodies, we are content to allow ourselves to believe that we have explained the great operations of nature. We find that the vegetable and animal kingdoms are composed of carbon, hydrogen, oxygen, and nitrogen. The granite mountains of the earth, and its limestone hills, and all its other geological formations, are found to be metals and oxygen, and carbon and sulphur, disposed to settle in harmonious union in their proper places by chemical affinity. But what really is the power which combines atom to atom, and unites molecule to molecule? Can we refer the process to heat? The influence of caloric, although by changing the form of bodies it sometimes assists combination, is to be regarded rather as in antagonism to the power of cohesion. Can it be thought that electricity is active in producing the result? During every change of state, those phenomena, which we term electrical, are manifested; but we thereby only prove the general diffusion of the electric principle, and by no means show that electricity is the cause of the chemical change. Can light determine these changes? It is evident, although light may be a disturbing power, that it cannot be the effective one; for many of these decompositions and recompositions are constantly going on within the dark and silent depths of the earth, to which a sunbeam cannot reach. That the excitation on the surface of the earth, produced by solar influence, may modify those changes, is probable. It is, however, certain that we must regard all manifestations of chemical force as dependent upon some secret principles common to all matter, diffused throughout the universe, but modified by the influences of the known imponderable elements, and by the mechanical force of aggregative attraction.

Bodies undergo remarkable changes of form, and present very different characters by re-actions, which are of several kinds. We suppose that a permanent corpuscular arrangement is maintained so long as the equilibrium of the molecular forces is undisturbed. Water, for instance, remains unchanged so long as the balance of affinity is kept up between the oxygen and the hydrogen of which it is composed, or so long as the oscillations of force between these combining elements are equal; but disturb this force, or set up a new vibratory action, as by passing an electric current through the water, or by presenting another body, which has the power of re-acting upon one of these corpuscular systems, and the water is decomposed, the hydrogen and oxygen gases being set free, or one alone is liberated, and the other combined with the molecules of the agent employed, and a new compound produced. This is chemistry, by which science we discover the laws which regulate all combinations of matter.

Having reason to conclude that atom combines with atom, according to a system most harmoniously arranged, there can be no difficulty in conceiving that molecule unites with molecule, in a manner regulated by some equally well-marked law. It was, indeed, a discovery by Wenzel, of Fribourg, that, in salts which decompose each other, the acid which saturates one

base will also saturate the other base ; and the subsequent observations of Richter, of Berlin, who attached proportional numbers to the acids and bases, and who remarked that the neutrality of metallic salts does not change during the precipitation of metals by each other, which led the way to the atomic theory of Dr. Dalton, to whom entirely belongs the observation, that the equivalent of a compound body is the sum of the equivalents of its constituents, and the discovery of combination in multiple proportions.

The elements of a molecule can take a new arrangement amongst themselves, without any alteration in the number of the atoms or of their weight, and thus give rise to a body of a different form and color, although possessing the same chemical constitution. This is the case with many of the organic compounds of carbon and hydrogen.

The elements of a compound may be dissociated, and thus the dissimilar substances of which it is composed, set free. A piece of chalk exposed to heat is, by the disturbance of its molecular arrangement, changed in its nature ; a gaseous body, carbonic acid, is liberated, and quicklime (oxide of calcium) is left behind. If this carbonic acid is passed through red-hot metal tubes, or brought in contact with heated potassium, it is resolved into oxygen and charcoal—the oxygen combining with the metal employed. The oxide of calcium (lime), if subjected to the action of a powerful galvanic current, is converted into oxygen and a metal, calcium. Thus we learn that chalk is a body consisting of two compound molecules,—carbonic acid, which is formed by the combination of an atom of carbon with two atoms of oxygen,—and lime, which results from the union of an atom of calcium with one of oxygen.

The condition requisite to the production of chemical action between bodies is that they should be dissimilar. Two elementary atoms are placed within the spheres of each other's influences, and a compound molecule results. Oxygen and hydrogen form water, oxygen and carbon give rise to carbonic acid; nitrogen and hydrogen unite to form ammonia ; and chlorine and hydrogen to produce hydrochloric acid. In all these cases an external force is required to bring the atoms within the range of mutual affinity : flame, the electrical spark, actinism, or the interposition of a third body, is necessary in each case. There are other examples in which no such influence is required. Potassium and oxygen instantly unite ; chlorine, iodine, and bromine immediately, and with much violence, combine with the metals to form chlorides, iodides, or bromides.

With compound molecules the action is in many cases equally active, and combination is readily effected, as in the cases of the acids and the oxides of some metals, which are all instances of the most common chemical attraction.

An elementary or simple molecule and molecules of a compound and different constitution are brought together, and a new compound results from an interchange of their atoms, whilst an element is liberated. These are essentially illustrations of analytical chemistry. Sulphuretted hydrogen is mixed with chlorine ; the chlorine combines with the oxygen of the water, whilst the hydrogen is liberated.

Two compound molecules being brought together may decompose each other, and form two new compounds by an interchange of their elements.

One element may be substituted for another under certain circumstances. Gold may be replaced by mercury ; copper will take the place of silver ; and iron will occasion the separation of copper from its solutions, the iron itself being dissolved to supply its place ; chlorine will substitute hydrogen in the carburetted hydrogen gases ; and many other examples might be adduced.

Chemical phenomena very frequently become of a complex character ; and one, two, or three of these cases may be occurring at the same time in the decomposition of one compound by another. Such are the general features of chemical science. Many peculiarities and remarkable phenomena connected with chemical investigations will be named, as the examination of the elementary composition of matter is proceeded with ; but, although the philosophy of chemical action is of the highest interest, it must not be allowed to detain us with its details, which are, indeed, more in accordance with a treatise on the science than one which professes to do no more

than sketch out those prevailing and striking features which, whilst they elucidate the great truths of nature, are capable of being employed as suggestive examples of the tendency of scientific investigation to enlarge the boundaries of thought, and give a greater elevation to the mind, leading us from the merely mechanical process of analysis up to the great synthetical operations, by which all that is found upon the earth for its ornament or our necessities, is created.

Among the most remarkable phenomena within the range of physical chemistry are those of *Catalysis*, or, as it has also been called, the "*Action of Presence*." There are a certain number of bodies known to possess the power of resolving compounds into new forms, without undergoing any change themselves. Kirchoff discovered that the presence of an acid, at a certain temperature, converted starch into sugar, and gum, no combination with the acid taking place. Thenard found that manganese, platinum, gold, and silver, and, indeed, almost any solid organic body, had the power of decomposing the binoxide of hydrogen, by their presence merely, no action being detected on these bodies. Edmund Davy found that powdered platinum, moistened with alcohol, became red-hot, fired the spirit, and converted it into vinegar, without undergoing, itself, any chemical change. Dœbereiner next discovered that spongy platinum fired a current of hydrogen gas directed upon it, which, by combining with the oxygen of the air, formed water. Dulong and Thenard traced the same property, differing only in degree, through iridium, osmium, palladium, gold, silver, and even glass. Further investigation has extended the number of instances; and it has even been found that a polished plate of platinum has the power of condensing hydrogen and oxygen so forcibly upon its surface, that they are drawn into combination and form water, with a development of heat sufficient to ignite the metal.

This power, whatever it may be, is common in both organic and inorganic nature, and on its important purposes Berzelius has the following remarks:—

"This power gives rise to numerous applications in organic nature; thus, it is only around the eyes of the potato that diastase exists: it is by means of catalytic power that disastase, and that starch, which is insoluble, is converted into sugar and into gum, which, being soluble, form the sap that rises in the germs of the potato. This evident example of the action of catalytic power in an organic secretion, is not, probably, the only one in the animal and vegetable kingdom, and it may hereafter be discovered that it is by an action analogous to that of catalytic power, that the secretion of such different bodies is produced, all which are supplied by the same matter, the sap in plants, and the blood in animals."

It is, without doubt, to this peculiar agency that we must attribute the abnormal actions produced in the blood of living animals by the addition of any gaseous miasma or putrid matter, of which we have in all probability, a fearful example in the recent progress of Asiatic Cholera; therefore the study of its phenomena becomes an important part of public hygiène.

Physical research has proved to us that all bodies have peculiar powers, by which they condense with varying degrees of force gases and vapors upon their surfaces; every body in nature, may, indeed, be regarded as forming its own peculiar atmosphere. To this power, in all probability, does catalysis belong. Different views have, however, prevailed on this subject, and recently Dr. Lyon Playfair has published an elaborate Memoir, in which he argues on the probability that the catalytic force is merely a modified form of chemical affinity, exerted under peculiar conditions.

Whatever may be the power producing chemical change, it acts in conformity with some fixed laws, and, in all its transmutations, an obedience to a most harmonious system is apparent.

It is curious to observe the remarkable character of many of these natural transmutations of matter, but we must content ourselves with a few examples only. For instance:—

Sugar, oxalic acid, and citric acid are very unlike each other, yet they are composed of the same elements; the first is used as a general condiment, the second a destructive poison, and the third a grateful and healthful acid: sugar is readily converted into oxalic acid, and in the process

of ripening fruits, Nature herself converts citric acid into sugar. Again, starch, sugar, and gum would scarcely be regarded as alike, yet their only difference is in the mode in which carbon, hydrogen, and oxygen combine. They are composed of the same principles, in the following proportions:—

	Carbon.	Hydrogen.	Oxygen.
Starch	12	10	10
Sugar	12	11	11
Gum	12	11	11

These *isomeric* groups certainly indicate some law of affinity which science has not yet discovered. Similar and even more remarkable instances might be adduced of the same elements producing compounds very unlike each other; but the above have been selected from their well-known characters. Indeed, we may state with truth that all the varieties of the vegetable world—their woody fibre—their acid or alkaline juices—the various exhudations of plants—their flowers, fruit, and seeds, and the numerous products which, by art, they are made to yield for the uses of man, are, all of them, compounds of these three elements, differing only in the proportions in which they are combined with nitrogen, or in some peculiar change of state in one or other of the elementary principles. By the impulse given to organic chemistry by Liebig, our knowledge of the almost infinite variety of substances, in physical character exceedingly dissimilar, which result from the combination of oxygen, hydrogen, and carbon, in varying proportions, has been largely increased And the science is now in that state which almost causes a regret that any new organic compounds should be discovered, until some industrious mind has undertaken the task of reducing to a good general classification, the immense mass of valuable matter which has been accumulated, but which, for all practical purposes, remains nearly useless and unintelligible.

These combinations, almost infinitely varied as they are, and so readily produced and multiplied as to be nearly at the will of the organic analyst, are not, any of them accidental : they are the result of certain laws, and atom has united with atom in direct obedience to principles which have been through all time in active operation. They are unknown; the researches of science have not yet developed them, and the philosopher has not yet made his deductions. They are to be referred to some secret fixed principles of action, to a force which has impressed upon every atom of the universe its distinguishing character. Chemistry makes us familiar with a system of order. The researches of analysts have proved that every body has a particular law of combination, to which it is bound by a mathematical precision ; but it is not proportional combination alone we have to consider. If *allotrophy* is evidenced in the mineral world, it is certainly far more strikingly manifested in the vegetable and animal kingdoms.

There are some cases in which bodies appear to combine without any limitation, as spirit of wine and water, sulphuric acid and water; but these must be considered as conditions of mixture rather than of chemical combination.

The composition of bodies is fixed and invariable, and a compound substance, so long as it retains its characteristic properties, must consist of the same elements united in the same proportions. Thus, sulphuric acid is invariably composed of 16 parts of sulphur and 24 parts of oxygen. Chalk, whether formed by nature or by the chemist, yields 43,71 parts of carbonic acid, and 56,29 parts of lime. The rust which forms upon the surface of iron by the action of the atmosphere, is as invariable in its composition as if it had been formed by the most delicate adjustment of weight by the most accurate manipulator, being 28 parts of iron and 12 parts of oxygen. This law is the basis of all chemical inquiry, all analytical investigations depending upon the knowledge it affords us, that we can only produce certain undeviating compounds as the results of our decompositions. We are not in a position to offer any explanation which will account for these constant quantities in combination. The forces of cohesion and elasticity have been advanced in explanation, on the strength of the fact that the solubility of a salt in water is regulated by cohesion, and that of a gas by its elasticity. Although it may appear that some cases of chemical combination are due to these powers,—as, for instance, when the union of oxalic acid or sulphuric acid with lime produces an insoluble salt,—we cannot thus explain the

constant proportions in which the metals, sulphur, oxygen, and similar bodies unite.

Another law teaches us, when compound bodies combine in more than one proportion, that every additional union represents a multiple of the combining proportion of the first;—with the difficulty which arises from the sub-multiple compounds we cannot deal;—further research may render their laws less obscure. We have seen that 8 parts of oxygen unite with 1 of hydrogen and 14 of nitrogen. It also unites with 110 of silver, 96 of platinum, 40 of potassium, 36 of chlorine, and 200 parts of mercury, giving rise to—

Water	9
Nitrous oxide	22
Oxide of silver	118
Oxide of platinum	104
Potash	48
Oxide of chlorine	44
Oxide of mercury	208

In these proportions, or in multiples of them, and in no others, will these bodies unite with the acids or other compounds. It will, of course, be understood that any other numbers may be adopted, provided they stand in the same relation to each other.

From the discovery of these harmonious arrangements was deduced the beautiful atomic theory to which allusion has been already made. Indeed, there does not appear to be any other way of explaining these phenomena, than by the hypothesis that the ultimate atoms of bodies have relatively the weights which we arbitrarily assign to them, as their combining quantities. These views are further confirmed by the fact, that gaseous bodies unite together by volume in very simple definite proportions: 100 measures of hydrogen and 200 measures of oxygen form water; 100 measures of oxygen and 100 measures of vapor of sulphur form sulphurous acid gas. Ammoniacal gas consists of 300 volumes of hydrogen and 100 volumes of nitrogen, condensed by combination into 200 volumes; consequently, we are enabled most readily to calculate the specific gravity of ammonical gas. The specific gravity of nitrogen is 0.9722, that of hydrogen 0.0694. Now, three volumes of hydrogen are equal to 0·2082, which added to 0.9722 is equal to 1.1804, which is exactly the specific gravity obtained by experiment.

There is no doubt, from the generality with which this law of volumes prevails, that it would be found to extend through all substances, provided they could be rendered gaseous; in other words there is abundant proof to convince us that, throughout nature, the process of combination, in the most simple ratio of volumes, is in operation to produce all the forms of matter known to us.

It has been shown, by the admirable investigations on Atomic Volumes of Dr. Playfair and Mr. Joule, that salts, containing water of crystallization, dissolve in water without increasing its bulk more than is due to the liquefaction of the water which these salts contain, the anhydrous salts taking up no space in solution. This was first observed by Dr. Dalton, who, in 1840, remarked that sugar and certain hydrated salts, on solution in water, increased its volume by a quantity precisely equal to the volume of water they held in combination. From this we are naturally led to conclude, that the volume occupied by a salt in the solid state has a certain relation to the volume of the same salt when in solution, and has also a fixed relation to the volume occupied by any other salt. The law appears to be: the atomic volume of any salt whatever (anhydrous or hydrated) is a multiple of 11, or of a number near 11, or a multiple of 9.8 (the atomic volume of ice), or the sum of a multiple of 11 or 9.8. Marignac, who has also paid much attention to the subject, does not think these numbers absolutely correct, but approximately so.

In addition to the laws already indicated, there appear to be some others of which, as yet, we have a less satisfactory knowledge, and, as a remarkable case, we may adduce the phenomena of *substitution*, or that power, which an elementary body, under certain conditions, possesses, of turning out one of the elements of a compound, and of taking its place.

Under the influence of these laws, all the combinations which we discover in nature take place. The metals, and oxygen, and sulphur, and phosphorus unite. The elements of the organic type, entering into the closest relations, give rise to every form of vegetable life. The acids, the

gums, the resins, and the sugar which plants produce; and those yet more complicated animal substances, bone, muscle, blood, and bile; albumen, casein, milk, with those compounds which, under the influence of vital power, resolve themselves into substances which are essential to the existence, health, and beauty of the animal fabric, are all dependent on these laws. But these metamorphoses must be further considered in our examination of the more striking cases of chemical action. The changes which result from organic combination are so remarkable, and withal they show how completely the whole of the material world is in subjection to chemical force, and every variety of form the result of mysterious combination, that some particular reference to these metamorphoses is demanded.

In nearly all cases of decided chemical action, every trace of the characters of the combining bodies disappear. We say decided chemical action, because, although sulphuric acid and water combine, and salts dissolve in water, we may always recognize their presence, and therefore these and similar cases cannot be regarded as strict examples of the phenomena under consideration.

Hydrogen and oxygen, in combining, lose their gaseous forms, and are condensed into a liquid—water. Sulphuric acid is intensely sour and corrosive; potash is highly caustic; but united they form a salt which is neither: they appear to have destroyed the distinguishing characters of each other. Combined bodies frequently occupy less space than they did previously to combination, of which numerous particular instances might be adduced. Gases in many cases undergo a remarkable condensation when chemically combined. In slaking lime, the water becomes solid in molecules of the hydrate formed, and the intense heat produced arises from the liberation of that caloric which had been employed to keep the water liquid. When a solid passes into the liquid state, cold is produced by the abstraction from surrounding objects of the heat required to effect fluidity. An alteration of temperature occurs whenever chemical change takes place, as we have already shown, with a few slight exceptions; and the disturbance caused by the exercise of the force of affinity frequently leads to the development of several physical powers.

Changes of color very frequently arise; indeed, there does not appear to be any relation between the color of a compound and that of its elements. Iodine is of a deep iron-grey color; its vapor is violet; it forms beautifully white salts with the alkalis, a splendid red salt with mercury, and a yellow one with lead. The salts of iron vary from white and yellow to green and dark brown. Those of copper, a red metal, are of a beautiful blue and green color, and the anhydrous sulphate is white.

Isomorphism, which appears in a very remarkable manner among the organic compounds, has, under the head of crystallization, already had our attention. There is also a class of bodies which are said to be *isomeric;* that is, to have the same composition, although different in their physical characters. But the idea that bodies exist, which, although of a decidedly different external character, are of exactly the same chemical composition and physical condition, is not tenable; and in nearly all the examples which have been carefully examined, a difference in the aggregate number of atoms, or in the mode in which those atoms have respectively arranged themselves, or that peculiar physical difference designated by the term *allotropy*, has been detected.

Oil of turpentine and oil of lemons have the same composition, each being composed of five equivalents of carbon and four of hydrogen. These substances form, from the difference perceptible in their external characters, a good example of isomerism.

The laws of organic chemistry are not, however, the same as those applying to inorganic combinations. Organic chemistry is well defined by Liebig, as the chemistry of compound radicals; and under the influence of vitality, nature produces compounds which have all the properties of simple elements.

When we reflect upon the conditions which prevail throughout nature, with a few of which only science has made us acquainted, we cannot fail to be struck with the various phases of being which are presented to our observation, and the harmonious system upon which they all appear to depend.

When we discover that bodies are formed of certain determinate atoms, which unite one with another, according to an arithmetical system, to form molecules, which, combining with molecules, observe a similar law, we see at once that all the harmonies of chemical combination—the definite proportions, laws of volume, and the like—are but the necessary consequences of these simple and guiding first principles. In the pursuit of truth, investigators must discover still further arrangements, which, from their perfection, may be compared to the melodious interblending of sweet sounds, and many of the apparently indeterminate combinations will, beyond a doubt, be shown to be as definite as any others. But we cannot reflect upon the fact that these atoms and these molecules are guided in their combinations by impulses, which we can only explain by reference to human passions, as the term *elective affinity* implies, without feeling that an impenetrable mystery of a grand and startling character in its manifestations surrounds each grain of dust which is hurried along upon the wind.

We now, habitually, speak of attraction and repulsion—of the affinity and non-affinity of bodies. We are disposed, from the discovery of the attractive and repelling poles of electrified substances, to regard these powers in all cases as depending upon some electrical state, and we write learnedly upon the laws of these forces. After all, it would be more honest to admit, that we know no more of the secret impulses which regulate the combinations of matter, than did those who satisfied themselves by referring all phenomena of these kinds to sympathies and antipathies; terms which have a poetic meaning, conveying to the mind, with considerable distinctness, the fact, and giving the idea of a feeling—a passion—involving and directing inanimate matter, similar to that which stirs the human heart, and certainly calculated to convey the impression that there is working within all things a living principle, and pointing, indeed, to "the soul of the world." The animated marble of ancient story is far less wonderful than the fact, proved by investigation, that every atom of matter is penetrated by a principle which directs its movements and orders its positions, and involved by an influence which extends, without limits, to all other atoms, and which determines their union or otherwise.

We have gravitation, drawing all matter to a common centre, and acting from all bodies throughout the wide regions of unmeasured space upon all. We have cohesion, holding the particles of matter enchained, operating only at distances too minute for the mathematician to measure; and we have chemical attraction, different from either of these, working no less mysteriously within absolutely insensible distances, and by the exercise of its occult power, giving determinate and fixed forms to every kind of material creation.

The spiritual beings, which the poet of untutored nature gave to the forest, to the valley, and to the mountain, to the lake, to the river, and to the ocean, working within their secret offices, and moulding for man the beautiful or the sublime, are but the weak creations of a finite mind, although they have for us a charm which all men unconsciously obey, even when they refuse to confess it. They are like the result of the labors of the statuary, who, in his high dreams of love and sublimated beauty, creates from the marble block a figure of the most exquisite moulding which mimics life. It charms us for a season; we gaze and gaze again, and its first charms vanish; it is ever still the same dead heap of chiselled stone. It has not the power of presenting to wearying eyes the change which life alone enables matter to give; and we admit the excellence of the artist, but we cease to feel at his work. The poetical creations are pleasing, but they never affect the mind in the way in which the poetic realities of nature do. The sylph moistening a lily is a sweet dream; but the thoughts which rise when first we learn that its broad and beautiful dark-green leaves, and its pure and delicate flower, are the results of the alchemy which changes gross particles of matter into symmetric forms,—of a power which is unceasingly at work under the guidance of light, heat and electrical force,—are, after our incredulity has passed away—for it is too wonderful for the untutored to believe at once—of an exalting character.

The flower has grown under the impulse of principles which have traversed to it on the beam of solar light, and mingled with

its substance. A stone is merely a stone to most men. But within the interstices of the stone, and involving it like an atmosphere, are great and mighty influences, powers which are fearful in their grander operations, and wonderful in their gentler developments. The stone and the flower hold, locked up in their recesses, the three great forces—light, heat, and electricity: and, in all probability, others of a more exalted nature still, to which these powers are but subordinate agents. Such are the facts of science, which, indeed, draw "sermons from stones," and find "tongues in trees." How weak are the creations of romance, when viewed beside the discoveries of science! One affords matter for meditation, and gives rise to thoughts of a most ennobling character; the other excites for a moment and leaves the mind vacant or diseased. The former, like the atmosphere, furnishes a constant supply of the most healthful matter; the latter gives an unnatural stimulus, which compels a renewal of the same kind of excitement, to maintain the continuation of its pleasurable sensations.

CHAPTER XII.

CHEMICAL PHENOMENA.

Water—Its Constituents—Oxygen—Hydrogen—Peroxide of Hydrogen—Physical Property of Water—Ice—Sea Water—Chlorine—Muriatic Acid—Iodine—Bromine—Compounds of Hydrogen with Carbon—Combustion—Flame—Safety Lamp—Respiration—Animal Heat—The Atmosphere—Carbonic Acid—Influence of Plants on the Air—Chemical Phenomena of Vegetation—Compounds of Nitrogen—Mineral Kingdom, &c. &c.

Without attempting anything which shall approach even to the character of a sketch of chemical science, we may be allowed, in our search after exalting truths, to select such examples of the results of combination as may serve to elucida e any of the facts connected with natural phenomena. In doing this, by associating our examination with well known natural objects or conditions, the interpretation afforded by analysis will be more evident, and the operation of the creative forces rendered more striking and familiar, particularly if at the same time we examine such physical conditions as are allied in action, and are sufficiently explanatory of important features.

A large portion of this planet is covered by the waters of the ocean, of lakes and rivers. Water forms the best means of communination between remote parts of the earth. It is in every respect of the utmost importance to the animal and vegetable kingdom; and indeed, it is indispensible in all the great phenomena of the inorganic world. The peculiarities of saltness or freshness in water are dependent upon its solvent powers. The waters of the ocean are saline from holding dissolved various saline compounds, which are received in part from, and imparted also to, the marine plants. Perfectly pure water is without taste; even the pleasant character of freshly-drawn spring-water is due to the admixture of carbonic acid. It is chemically composed of two volumes of hydrogen gas—the lightest body known, and at the same time highly inflammable—united with one volume of oxygen, which excites combustion, and continues that action, producing heat and light with great energy. By weight, one part of hydrogen is united with eight of the oxygen, or in 100 parts of water we find 99.9 oxygen, and 11.1 of hydrogen gas. That two such bodies should unite to furnish the most refreshing beverage, and indeed the only natural drink for man and animals, is one of the extraordinary facts of science. Hydrogen will not support life—we cannot breathe in it and live; and oxygen would over-stimulate the organic system, and, producing a kind of combustion, give rise to fever in the animal frame; but, united, they form that drink, for a drop of which the fevered monarch would yield his diadem, and the deprivation of which is one of the most horrid calamities that can be inflicted upon any living or moving thing. Water appears as the antagonist principle to fire, and the ravages of the latter are quenched by the assuaging powers of the former; yet a mixture of oxygen and hydrogen gases, in the exact proportion in which they form water, explodes with the utmost violence on the contact of flame, and, when judicously arranged, produces the most intense degree of heat known;—such is the remarkable difference between a merely mechanical mixture and a chemical combination.

If we place in a globe, oxygen and hydrogen gases, in the exact proportions in which they combine to form water, they remain without change of state. They appear to mix intimately; and, notwithstanding the difference in the specific gravities of the two gases, the lighter one is diffused through the heavier in a curious manner, agreeably to a law which has an important bearing on the conditions of atmospheric phenomena. The moment, however, that an incandescent body, or the spark from an electric machine, is brought into contact with the mixed gases, they ignite, explode violently, and combine to form water. The discovery of the composition of water was thus synthetically made by Cavendish—its constitution having been previously theoretically announced by Watt.

If, instead of combining oxygen and hydrogen in the proportions in which they form water, we compel the hydrogen to combine with an additional equivalent of oxygen, we have a compound possessing many properties strikingly different from water. This—peroxide of hydrogen, as it is called—is a colorless liquid, less volatile than water, having a metallic taste. It is decomposed at a low temperature, and, at the boiling point, the oxygen escapes from it with such violence, that something like an explosion ensues. All metals, except iron, tin, antimony, and tellurium, have a tendency to decompose this compound, and separate it into oxygen and water. Some metals are oxidized during the decomposition, but gold, silver, platinum, and a few others, still retain their metallic state. If either silver, lead, mercury, gold, platinum, manganese, or cobalt, in their highest states of oxidation, are put into a tube, containing this peroxide of hydrogen, its oxygen is liberated with the rapidity of an explosion, and so much heat is excited, that the tube becomes red hot. These phenomena, to which we have already referred in noticing catalysis, are by no means satisfactorily explained, and the peculiar bleaching properties possessed by the peroxide of hydrogen, sufficiently distinguish it from water. There are few combinations which show more strikingly than these, the difference arising from the chemical union of an additional atom of one element. Similar instances are numerous in the range of chemical science; but scarcely any two exhibit such dissimilar properties. During the ordinary processes of combustion, it has been long known that water is formed by the combination of the hydrogen of the burning body with the oxygen of the air. The recent researches of Schonbein have shown that this peroxide of hydrogen—or, as he calls it, ozone—is produced at the same time, and that it is developed in a great many ways, particularly during electrical changes in the atmosphere. Thus we obtain evidence that this remarkable compound, which was considered as a chemical curiosity merely, is diffused very generally through nature, and produced under a great variety of circumstances. During the excitation of an electrical machine, or the passage of a galvanic current through water by the oxidation of phosphorus, and probably in many similar processes—in particular those of combustion, and we may, therefore, infer also of respiration—this principle is formed. From observations which have been made, it would appear that, during the night, when the activity of plants is not excited by light, they act upon the atmosphere in such a way as to produce this peroxide of hydrogen; and its presence is said to be indicated by its peculiar odor during the early hours of morning. We are not yet acquainted with this body sufficiently to speculate on its uses in nature; without doubt, they are important, perhaps second to those of water only. It is probable that ozone may be the active agent in removing from the atmosphere, those organic poisons to which many forms of pestilence are traceable; and it is a curious fact, that a low electrical intensity, and a consequent deficiency of atmospheric ozone, marks the prevalence of cholera, and an excess distinguishes the reign of influenza.

Water is one of the most powerful chemical agents, having a most extensive range of affinities, entering directly into the composition of a great many crystallizable bodies and organic compounds. In those cases where it is not combined as water, its elements often exist in the proportions in which water is formed. Gum, starch, and sugar only differ in the proportions in which the elements of water are combined with the carbon.

In saline combinations, and also in many

organic forms, we must regard the water as condensed to the solid form ; that is, to exist as ice. We well know that, by the abstraction of heat, this condition is produced ; but, in chemical combinations, this change must be the result of the mechanical force, exerted by the power of the agency directing affinity.

In the case of water passing from a liquid to a solid state, we have a most beautiful exemplification of the perfection of natural operations. Water conducts heat downwards but very slowly; a mass of ice will remain undissolved but a few inches under water, on the surface of which, ether, or any other inflammable body, is burning. If ice (solid water) swam beneath the surface, the summer sun would scarcely have power to thaw it; and thus our lakes and seas would be gradually converted into solid masses.

All similar bodies contract equally during the process of cooling; and if this is applied to water, it has been thought that the result would be the sudden consolidation of the whole mass. A modification of the law has been supposed to take place to suit peculiar circumstances of water. Nature never modifies a law for a particular purpose; we must, therefore, seek to explain the action of the formation of ice, as we know it, by some more rational view.

Water expands by heat, and contracts by cold ; consequently, the coldest portions of this body occupy the lower portions of the fluid ; but it must be remembered that these parts are warmed by the earth. Ross, however, states that at the depth of 1,000 fathoms the sea has a constant temperature of 39°. Water is at its greatest density at 49° of Fahrenheit's thermometer ; in cooling further, it appears to expand, in the same way as if heated ; and, consequently water, colder than this point, instead of being heavier, is lighter, and floats on the surface of the warmer fluid. It does not seem that any modification of the law is required to account for this phenomenon. Water cooled to 40° still retains its peculiar corpuscular arrangement; but immediately it passes below that temperature, it begins to dispose itself in such a manner that visible crystals may form the moment it reaches 32°. Now, if we conceive the particles of water at 39° to arrange themselves in the manner necessary for the assumption of the solid form, by the particular grouping of molecules in an angular instead of a spheroidal shape, it will be clear, from what we know of the arrangement of crystals of water—ice—that they must occupy a larger space than when the particles are disposed, side by side, in minute spheres. This expansion still goes on increasing, from the same cause, during the formation of ice, so that its specific gravity is less than that of water at any temperature below 40°.

Water, at rest, may be cooled many degrees below the freezing point without becoming solid. This is easily affected in a thin glass flask ; but the moment it is agitated, it becomes a firm mass. Here we have another cause aiding in producing crystals of ice on the surface of water, under the influence of the disturbance produced by the wind, which does not extend to any depth.

As oxygen and hydrogen gases enter largely into other chemical compounds beside water, it is important to consider some of the forms of matter into the composition of which these elements enter. To examine this thoroughly, a complete essay on chemical philosophy would be necessary; we must, therefore, be content with referring to a few of the more remarkable instances.

The waters of the ocean are salt; this arises from their holding, in solution, muriate of soda (common culinary salt) and other saline bodies. This muriate of soda is a compound of muriatic acid and soda: muriatic acid is hydrogen, combined with a most remarkable gaseous body, called, from its yellow color, *chlorine;* and soda, oxygen in union with the metal sodium. Chlorine, in some respects, resembles oxygen ; it attacks metallic bodies with great energy; and, in many cases, produces the most vivid incandescence; during the process of combination. It is a powerful bleaching agent, is destructive to animal life, and rapidly changes all inorganic tissues. There are two other bodies in many respects so similar to chlorine, although the one is at the ordinary temperatures solid, and the other fluid, and which are also discovered in sea-water, or in the plants growing in it, that it is difficult to consider them otherwise than as different forms of the same principle. These are

iodine and bromine, and they both unite with hydrogen to form acids. The part which chlorine performs in nature is a great and important one. As muriate of soda, we may trace it in large quantities through the three kingdoms of nature, and the universal employment of salt as a condiment, indicates the importance to the animal economy of the elements composing it. Iodine has been traced through the greater number of marine plants, existing apparently, as an essential element of their constitution; it has been detected in some mineral springs, and in small quantities in the mineral kingdom. Bromine is found in sea-water, although in extremely minute quantities, and in a few saline springs; but we have no evidence to show that its uses are important in nature.

Hydrogen, again, unites with carbon in various proportions, producing the most dissimilar compounds. The air evolved from stagnant water, and the fire-damp of the coal mine, are both carburetted hydrogen; and the gas which we employ so advantageously for illumination, is the same, holding an additional quantity of carbon in suspension. Naptha, and a long list of organic bodies, are composed of these two chemical elements.

These combinations lead us, naturally, to the consideration of the great chemical phenomena of combustion, which involve, indeed, the influences of all the physical powers. By the application of heat, we produce an intense action in a body said to be combustible; it burns,—a chemical action of the most energetic character is in progress, the elements which constitute the combustible body are decomposed, they unite with some elementary principles and new compounds are formed. A body burns—it is entirely dissipated, or it leaves a very small quantity of ashes behind unconsumed, but nothing is lost. Its volatile parts have entered into new arrangements, the form of the body is changed, but its constituents are still playing an important purpose in creation.

The ancient notion that fire was an empyreal element, and the Stahlian hypothesis of a phlogistic principle on which all the effects of combustion depended, have both given way to the philosophy of the unfortunate Lavoisier—which has, indeed, been modified in our own times—who showed that combustion is but the development of heat and light under the influence of chemical combination.

Combustion was, at one period, thought to be always due to the combination of oxygen with the body burning, but research has shown that vivid combustion may be produced where there is no oxygen. The oxidizable metals burn most energetically in chlorine, and some of them in the vapor of iodine and bromine, and many other unions take place with manifestations of incandescence. Supporters of combustion were, until lately, regarded as bodies distinct from those undergoing combustion. For example, hydrogen was regarded as a combustible body, and oxygen as a supporter of combust on. Such an arrangement is a most illogical one, since we may burn oxygen in contact with hydrogen, in the same manner as we burn hydrogen in contact with oxygen; and so in all the other cases, the supporter of combustion may be burned in an atmosphere formed of the, so called, combustible. The ordinary phenomena of combustion are, however, due to the combination of oxygen with the body burning; therefore every instance of oxidization may be regarded as a condition of combustion, the difference being only one of degree.

Common iron, exposed to air and moisture, rusts; it combines with oxygen. Pure iron, in a state of fine division, unites with oxygen so readily, that it becomes incandescent, and in both cases oxide of iron is formed. This last instance is certainly a case of combustion; but in what does it differ from the first one, except in the intensity of the action? The cases of spontaneous combustion which are continually occurring, are examples of an analogous character to the above. Oxygen is absorbed, it enters more or less quickly, according to atmospheric conditions, into chemical combination, heat is evolved, and eventually, the action continually increasing, true combustion takes place. In this way our cotton-ships, storehouses of flax, piles of oiled-cloth, sawdust, &c., frequently ignite; and to such an influence is to be attributed the destruction of two of our ships of war, a few years since, in the Devonport naval arsenal.

In the economic production of heat and light, we have the combination of hydrogen

and carbon with the oxygen of common air, forming water and carbonic acid. In our domestic fires we employ coal, which is essentially a compound of carbon and hydrogen, and some matters which must be regarded as impurities; the taper, whether of wax or tallow, is made up of the same bodies, differing only in their combining proportions, and, like coal gas, these burn as carburetted hydrogen. All these bodies are very inflammable, having a tendency to combine energetically with oxygen at a certain elevation of temperature.

We are at a loss to know how heat can cause the combination of those bodies. Sir Humphry Davy has shown that hydrogen will not burn, nor a mixture of it with oxygen explode, unless directly influenced by a body heated so as to *emit light*. May we not, therefore, conclude that the chemical action exhibited in a burning body is a development of some latent force, with which we are unacquainted, produced by the absorption of light;—that a repulsive action at first takes place, by which the hydrogen and carbon are separated from each other;—and that in the nascent state they are seized by the oxygen, and again compelled, though in the new forms of water and carbonic acid, to resume their chains of combining affinity.

Every equivalent of carbon and of hydrogen in the burning body unites with two equivalents of oxygen, in strict conformity with the laws of combination. The flame of hydrogen, if pure, gives scarcely any light, but combined with the solid particles of carbon, it increases in brightness. The most brilliant of the illuminating gases is the olefiant gas, produced by the decomposition of alcohol, and it appears to be hydrogen charged with carbon in the point of saturation. Flame is a cone of heated vapor, becoming incandescent at the points of contact with the air, a mere superficial film only being luminous. It is evident that all the particles of the gas are in a state of very active repulsion over the surface, since flame will not pass through wire gauze of moderate fineness Upon this discovery is founded the inimitable safety-lamp of Davy, by means of which the explosive gases of a mine are harmlessly ignited within a cage of iron gauze. This effect has been attributed to a cooling influence of the metal; but, since the wires may be brought to a degree of heat but little below redness without igniting the fire-damp, this does not appear to be the cause. It appears to present an example exactly the converse of that already stated with reference to the spheroidal state of water, and it affords additional evidence that the condition of bodies at high temperatures is subject to important physical changes.

The researches which led to the safety-lamp may be regarded as among the most complete examples of correct inductive experiment in the range of English science, and the result is certainly one of the proudest achievements of physico-chemical research. By merely enveloping the flame of a lamp with a metallic gauze, the laborer in the recesses of the gloomy mine may feel himself secure from that outpouring current of inflammable gas, which has been so often the minister of death; he may walk unharmed through the explosive atmosphere, and examine the intensity of its power, as it is wasted in trifling efforts within the little cage he carries. Accidents have been attributed to the "Davy," as the lamp is called among the colliers; but they may in most cases be traced to carelessness on the part of those whose duty it has been to examine the lamps, or to the recklessness of the miners themselves.

To be continued.

From La Lumiere.

HELIOGRAPHIC SOCIETY OF FRANCE.

Translated from the French, (expressly for this Journal) by J. Russell Snelling.

MEETING OF FRIDAY, JUNE 13, 1851.

M. Vigier presiding.

THE President read part of a letter, addressed to him by M. Gonin, heliographic artist at Paris, and inventor of a new machine for polishing, and which at the same time abridges and improves the longest and most delicate operation of heliography upon metallic plates. He requests the Society to appoint a Committee to whom the examination of this new machine shall be intrusted. The letter of M. Gonin was accompanied by several proofs, the beauty of which testified in favor of the invention. A Committee was appointed to examine it.

M. Eugene Piot presented to the Society the first work of *monumental Italy*. Placed before the artistic world under the form and appearance imparted to them by M. Piot, photographic designs will certainly advantageously compete with the productions of the lithographer and engraver.

M. Gaudin desired that a discussion should be opened respecting the article of the American Photographic Art-Journal, in which it is stated that a method had been discovered of reproducing the colors on Daguerrean plates; he thought it would be well to ascertain to what extent the authenticity of this discovery could be relied upon. He had much doubt about it himself; and did not think that the French *savants*, MM. Becquerel and Niepce de St. Victor, who are so much interested in the question, should be discouraged in their researches by this news. They have already taken the first step, and I do not believe, said M. Gaudin, that others have been any more successful.

How can we obtain colors by photography? There is but one method, which M. Becquerel has employed; this is to impress a crystalized compound in such manner that the color impresses upon the substance a peculiar arrangement—a kind of phosphoresence. But M. Gaudin did not think that it would ever be possible to make the colors appear with mercury, which is a continuing agent; there is much delusion existing upon this subject.

M. Bayard thought it impossible to discuss this question in view of the limited information which has reached us in relation to this discovery.

M. Villis,* an American, being present at the meeting, said that the process of Mr. Hill was in no respect like that of M. Becquerel; he had written to Mr. Hill, requesting him to send some proofs; these proofs have been promised him.† The inventor at that time possessed fifty-five. M. Villis added that he had received several other letters which confirm the *existence* of this important discovery.

The President inquired of Mr. Villis, if, among the letters which he had received, it was stated that any had been eye-witnesses to the discovery. Mr. Villis replied in the negative; they simply wrote him that there was not the least doubt manifested to the contrary.

M. DeMontfort considered that Mr. Hill would not compromise the reputation which he has apparently so well acquired as photographer, by lightly asserting the discovery of an event of such great importance; on the other hand he could not believe that the American journal which has published Mr. Hill's letter, and which vouches for the event, would be disposed to incur the responsibility of propagating similar intelligence, unless there really was some foundation for the belief.‡ We shall

* Querry.—Should it not be Willis?—*Ed. Phot. Art-Jour.*

† Perhaps he has got them by this time.

‡ At the time we made the announcement here were very good grounds for the belief so generally entertained. We afterwards gave our reason, for coming to the conclusion that Mr. Hill was incapable of perfecting the process, and our calculations have been found correct. We were the first to announce the discovery—and did so trustingly and sincerely—and we were the first to point out the

soon decide in relation to this matter, continued M. DeMontfort. I have an agent in New York whom I have requested to keep me advised upon this subject, and I expect a reply from day to day. Mr. Villis then announced that he should leave for America, and that his services were at the disposal of the Society in regard to any commission it might wish to intrust him with. The President returned his thanks to Mr. Villis for his generous offer, and several members afterwards expressed the opinion that new documents more precise would confirm the existence of a discovery, the announcement of which alone, had created the greatest anxiety in the photographic world. The inventor will certainly hasten to convince the incredulous (and there are many,) by sending to Europe a certain number of proofs which will set our minds at rest respecting the authenticity of the discovery, and enable us to judge of the importance of his first results. Is it not strange that he has now no specimens at the great Exhibition in London ?

The debate being closed on this subject, M. Martin asked the members of the committee, appointed to examine the papers intended for Photography who were present, if they had any instructions to give. M. Bayard, member of this committee, replied, that this body had been some time organized, but that its efforts were thus far futile. It was impossible to stimulate the manufacturers to undertake a particular paper; all that it could require of them, was to give more attention to the ordinary manufacture, so that the qualities of paper might be more frequently adapted to Photography.

The President recommended Photographers to remedy this fault in the manufacture by certain preparations.

The splendid results already obtained by M. LeGray upon waxed paper clearly proves that paper will soon compete with glass in fineness and transparency. The pamphlet* which he has published will enable the public itself to ascertain the advantage of this process above others. The question of manufacture will be, in a measure decided, or at least simplified, when the dealers of chemical productions shall, to some extent, afford to the trade a negative paper, the good quality of which shall depend no longer upon the risk of manufacturing, but upon a fixed and constant substance, by means of which we will be able to improve it. L. A. Martin.

MEETING OF FRIDAY, JUNE 28, 1851.

M. J. Ziegler, President.

The President, after opening the meeting, again called the attention of the Society to the fine work of M. Maxime Ducamp, who has brought from Egypt and Syria 216 proofs taken from the finest monuments of those countries; also a veritable *chef d'œuvre* which he employed for drawing off the positive proofs. As soon as his collection is complete, M. Maxime Ducamp will apprise the Society, so that every member may examine it in all its details.

M. Blanquart Evrard presented to the Society his *Treatise on Photographs*—a complete work upon the subject—in which the author has neglected none of the numerous questions that are connected with this new science. The thanks of the Society were voted M. Evrard for this presentation.

Some time was then taken up by discussing the propriety of using in photographic language certain words more or less definite, and more or less adapted to the rules of etymology.

After having shown, by analogy, that the word *photographer* should be employed instead of *photographist ;* and that the word *sensibility* sufficiently expresses the qualities of certain impressible matters, without the necessity of saying *luminous sensibility*, which is an inadmissable form of speech, the President made some suggestions upon the use of the term *figure* in the arts. By this term artists understand all the entire model; with the school of Fine Arts, there is the conjunction of the figure, and the conjunction of the head, which comprises the head proper and the face. This school being national, and the professors being members of the Academy, it is authorized to observe these distinctions. Heliographers frequently need new modes of expression, but they ought not to make innovations unless it is impossible to do

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discrepancies in Mr. Hill's statements. We acted as we thought it our duty in both cases.—*Ed. Phot. Art-Jour.*

* Now in course of translation for the Photographic Art Journal.

otherwise. It was in one of these instances of defective etymology that the word *photogenic* was created, which is very appropriate for qualifying all bodies that generate light. But can this expression be properly applied to papers, or to the product intended to receive the image, that is to say the image. The President thought not. Would it not be better in this case, he added, to say *iconogenic?*

M. De Valicourt admitted the utility of this expression, which may be distinguished from all those which are allied to it, as *iconography* and *iconolast.* In this review of the several terms in use, the word *bon venue* (success), employed by M. Blanquart Evrard, was cited and judged warrantable by all the members present.

The Society did not intend by any means to impose new names or to regulate the language, except where it may be defective, since the manner of expression frequently depends upon received custom. But as in every discussion, in every dissertation, it is important to adhere to proper terms, under penalty of misconstruction and vain disputes, the Society should maintain a certain vocabularly which may be logical, and which can be referred to in case of heliographic discussions.

The science, being new, has not had sufficient time to occasion confirmed habits, rendered respectable by their antiquity.

HELIOGRAPHIC PRESS.

Being assisted at one of the preceding meetings, M. Le duc de Luynes proposed to entertain the Heliographic Society with an important project which would render the photographic press necessary; it reproduces the titles of all the books composing the National Library, and thus makes the catalogue. M. Le duc de Luynes expressed to M. Ziegler his regret in not having had occasion to explain this project at the meeting of May 2.

The President resorted to every advantage which he could possibly have to copy photographically the titles with their delicacy, their marks and their defects. Experiments have now been crowned with success; we must, therefore, hope that M. Albert de Luynes will soon give the project which he has surrendered to the committee, appointed by the National Assembly, for the important and urgent question of the catalogue of our immense Library.

UTILITY OF PHOTOGRAPHY FOR EXPOSANTS.

Among the services that photography renders to artists, added the President, I know one of considerable importance; it is the facility with which they could copy photographically, their pictures, so that different persons who desired might see and purchase them, either in foreign countries or in France. We may in the same manner reproduce a wall covered with pictures, and thus respond to the desire of amateurs who wish to compare and choose accordingly.

There has been received this year, in the way of fine arts, a considerable number of demands accompanying photographs representing different pictures. Artists have no other means of making their works known. The number of works exposed at the Palais-National being so immense, that the indication of the number and subject might have been insufficient to induce a judgment from the administration of Fine Arts.

There is then great importance—and even a pecuniary importance—in this instance, where photography comes in to the aid of artists. In the same manner M. LeGray is about to make a fine proof from a picture of M. Meissonier.

QUESTION OF THE WHITE CAMERA.

The President remarked that M. Blanquart Evrard had written an article upon the whitened camera. He was engaged to try it, and, if it did not succeed at first, he would continue his efforts.

M. Vaillat said that he had tried for ten years, the camera lined with white, without much success. In certain circumstances the proof still succeeded with ordinary effect; in other circumstances, there was much disorder produced.

M. Durien reminded the Society that he had brought proofs which were not wanting in vigor, and which he had obtained with the whitened camera. But he acknowledged, that in very clear weather it was very prejudicial; it is when the light is feeble that the white camera contributes to impart more intensity, and facilitates the operation.

M. Le Gray has also observed that in

many instances the white camera produced no effect; and that it was necessary finally for obtaining good results to adapt an object-glass, with a large plate, to a half plate camera. M. Durien, however, has obtained the proper results, by making use of an object-glass of large plate upon a camera likewise of large plate.

The President quoted upon this question of the white camera, the completely practical opinions of those who practiced portraiture among the daguerreotypists of the profession. Having entered one day an establishment of this kind, the mistress of the house showed him two camera-obscuras, opened and placed near the window; one was entirely white and the other entirely black inside. Having asked the reason of this, the lady told him that it was necessary to have both kinds; as the white camera could be used with success in cloudy weather, and the black camera also successfully in clear weather. He thought that this opinion was worthy of consideration.

M. Bayard thought that if he employed the whitened camera to operate, it would always spoil his proofs; it would be essential to whiten only the floor of the camera, in such a manner that the reflection may act upon the part of the proof which should reproduce the sky. We could obtain by this means a lighter tint.

M. Vaillat said that the best system, according to his opinion, was to keep the black camera closely shut, so that nothing may gain admittance except the light necessary to produce the image. He arranged at his house a perfectly black cabinet and during a few days he obtained very good results. M. Durien is confident that he can obtain good proofs by means of the whitened camera, but he has not found it sufficiently advantageous to engage his attention. He thinks, moreover, that this system has not added much to the rapidity of the operation.

The debate being exhausted on this subject, new praises were bestowed upon the work of M. Evrard by MM. Ziegler and Durien. LOUIS A. MARTIN.

MEETING OF FRIDAY, JULY 25, 1851.

M. Durien, presiding.

The President announced at the commencement of the meeting that M. DeValicourt had presented to the Society his new and complete Manual of Photography on metal, on paper, and on glass.* This Manual comprises besides a summary history and criticism upon the origin and progress of photography, all the discoveries and improvements which have been made by MM. Niepce, Daguerre, F. Talbot, Herschel, Hunt, Blanquart Evrard, Niepce de St. Victor, Fizeau, Claudet, Baron Gros, Humbert de Molard, Le Gray, Bayard, Hennemann, Malone, Gaudin, Grove, etc.

Upon the occasion of this presentation the President asked if the Society would appoint a Committee to make out a report either printed, or simply verbal, upon the works presented. After a discussion upon this subject, in which MM. Francis Wey, DeMontfort, Gaudin, Leblanc and Durien took part, the Society decided that a report of this kind should not be made; but left to the journal *La Lumiere* the duty of reporting publications relating to photography under its own responsibility, and that of its editors. A vote of thanks was then tendered to M. de Valicourt.

The nomination of a Committee for the purpose of erecting a monument to Daguerre, and for which a subscription had been opened by the Society, was postponed upon the proposition of M. De Montfort, who spoke of the absence of several members of the Society, whom the fine weather, and the execution of very important heliographic works, had prevented from attending.

M. Durien, after resigning the Presidency to M. De Montfort, read a report on behalf of the Committee appointed to examine the apparatus for bromodizing plates, which had been presented by M. Edmond Fruit at the meeting of last April.

Report on behalf of the Committee appointed to test the apparatus of M. Fruit, designed for distributing the vapors of bromine upon plates.

MESSIEURS:—The Society at one of its former meetings, appointed a Committee composed of MM. Le Baron Gros, De Montfort, Ribot, Bisson and Durien, to examine and report upon an apparatus

* This work will also be published in this Journal.—*Ed. Phot. Art-Journal.*

presented by M. Fruit, and intended for the purpose of distributing with constant uniformity the vapors of bromine, chloride of iodine, or other chemicals, upon daguerrean plates. I now submit to you on behalf of the Committee, and by its request, a report of its investigations.

The members of the Committee have, collectively and individually, tested repeatedly the apparatus of M. Fruit; and in these various experiments they have been able to secure excellent results.

The apparatus of M. Fruit is a box, the bottom and sides of which are entirely lined with glass, and the cover of which—hermetically sealed—is formed by a plate of porous porcelain, through which the vapor may pass. This porcelain itself is covered with a plate of polished glass, which prevents all evaporation during the intervals between the operations.

On one side of the box is an opening, through which enters a connecting tube, closely connected with a glass stop-cock, and the other end of which is attached to a bottle which contains the bromine or any other body which undergoes the evaporation. When the stop-cock is opened the vapor penetrates and spreads itself over the whole capacity of the box, to the extent which we desire—even to saturation.

The vapors thus diffused in the box pervade equally the whole inside, and encountering nothing in their exit except the porous porcelain, an evaporation takes place, which is regular as well as uniform.

This system, independently of the regularity with which it permits the vapors to be distributed upon the plate situated over the porous porcelain, as in the glass box, the model of which M. Le Baron Gros has given in his work for bromide of lime—has the undoubted advantage of evaporating substances in all their purity, without any intermixture or without any reaction.* The vapors are thus always in the same conditions, and there is no need of enforcing upon any the importance which this may have in the success of operations.

Nothing could be more suitable for experimenting with different vapors, and we might thus discover a useful process for coagulating albumenized papers by acetic acid, as that taught by M. Blanquart Evrard for photography on paper.

M. Le Baron Gros, who has tried M. Fruit's box longer than any of us, selects for his use the *chloride of bromine*, several drops only of which he puts into the bottle; he has thus obtained the finest tones, and in less time than with bromine.

Upon the whole, it appears to us that this apparatus might advantageously replace the boxes which we use for bromide of lime, and substances which it is not always easy to prepare and preserve in conditions perfectly identical.

The only critical notice which we have thought it a duty to make, is that in its present state, the apparatus is too extensive. It could be reduced without very great difficulty to the size of the bromine boxes generally in use.*

Finally, it might be essential to adopt for the stop cock which opens or intercepts the communication between the *flacon-resevoir* and the box, a system which permits us at will to regulate perfectly the quantity of vapor which this box should contain, according to the proportion with which we might wish to practice.

E. Durien, Reporter.

July 25, 1851.

After the reading of this report, M. De Montfort remarked that it would be desirable that an analogous method to that presented in the apparatus of M. Fruit, should be employed for iodizing plates, as it would likewise prove a great improvement in an application of this kind. Already, added he, Americans use with advantage a flannel impregnated with iodine vapors, to the influence of which they submit the plate. The coating of iodine is applied more gradually by this means, and it is more equally distributed. This method also presents this advantage;—it is that the iodine vapor, being distributed equally upon the whole surface, if in the commencement of the operation this distribu-

* This invention is precisely similar to one described to us by Dr. Esterly, of Newburg, N. Y., in 1849. He died, however, while making preparations to bring it before the Daguerrean public.—*Ed. Phot. Art-Jour.*

* M. Edmond Fruit at the close of the report, requested us to announce the anxiety which he feels to remedy the evil justly referred to, and that he is hastening to reduce the size of his apparatus one-half. F. A. Renard.

tion is found to be defective, we may at once be sure that the fault is in the polishing, and thence it becomes useless to prolong an operation which would unquestionably yield a bad result.

M. Vaillet had found this precaution entirely useless.

M. De Montfort persisted no less in recommending the use of such method; if some operators (and they are indeed a small number), have reached almost a certainty of a good result in practice, perhaps it would have been attained sooner and with less difficulty by turning their attention to that kind of precaution which we just pointed out. Consequently it may not be useless to recommend them and bespeak for them the researches of masters in the Photographic Art. F. A. Renard.

SILVER AND ITS COMPOUNDS.

SILVER, like gold, was as much valued in the most remote ages of antiquity of which we have any record, as at the present day. It is procured from its ores chiefly by amalgamation and cupellation. It occurs native in masses or in the form of octahedral or cubic crystals. It is also found in combination with gold, lead, antimony, sulphur, copper and arsenic.

When pure, silver has a white color, and high metallic lustre, it is extremely malleable, very ductile and soft, and may be easily cut with a knife. Pure silver is obtained by placing a copper rod in a solution of the nitrate, digesting the precipitate in caustic ammonia, and washing with water; or by boiling recently precipitated and still moist chloride of silver in a bright iron vessel along with water.

Another method of obtaining pure silver is to dissolve the ore, or ordinary plates, in nitric acid, and add to the solution muriate of soda as long as any precipitate falls down; by this means a nitrate of soda and muriate of copper will be held in solution, and a chloride of silver precipitated as a bulky heavy white powder. (The copper is the metal with which silver is generally alloyed to give it hardness.) The chloride of silver is then to be separated by filtration; to be well washed with pure water, dried, and mixed with carbonate of soda or potash, put into a black lead crucible and exposed to a strong fire, when a button of metallic silver will be the result.

When silver is in combination with copper it may be separated by cupellation, a process which consists in exposing the alloy mixed with lead to the action of heat in the muffle of a cupellation furnace; the mixture is put in a bone earth crucible; the lead assists in oxydizing the copper, both of which are absorbed by the crucible, and leave the metallic silver behind in great purity. The lead must be added in proproportion according to the quantity contained in the alloy; the larger the quantity of copper the larger must be the proportion of lead to be added. From six to ten times the weight of lead will be generally sufficient for most alloys of silver.

The silver coin generally used by Daguerreotypists contain more or less alloy; they should therefore refine it, before use, themselves, or obtain it from a refiner whose reputation can be depended upon.

Silver is entirely soluble in diluted nitric acid, which when treated with muriate of soda gives a white precipitate, entirely soluble in ammonia water—with muriatic acid a white curdy precipitate (*chloride of silver*,)—also soluble in ammonia, and insoluble in nitric acid, and blackened by exposure to light. It gives white precipitates with solutions of the alkaline carbonates, oxalates and prussiates—yellow precipitates with the alkaline arsenates and phosphates—red precipitates with the arseniates—

brown precipitates with the fixed alkalies—black precipitates with sulphuretted-hydrogen—and pure silver with phosphorus and metallic copper.

Chloride of Silver.—This compound of chlorine and silver is often found native in silver mines, and is called *luna cornea* or horn silver, and is always formed when muriatic acid or any soluble muriate is added to a solution of nitrate of silver. It is also prepared when silver is heated in chlorine gas. When first precipitated it is purely white; but when exposed to the action of light, or the direct rays of the sun, it becomes of a violet hue, approaching to a black in a very short time. During this change muriatic acid is given off, and the oxide of silver is formed, to which circumstance the color is ascribed by Berthollet. It is insoluble in water and nearly so in the strongest acids, but is soluble in ammonia and hyposulphurous acids. It fuses at 500° F, and passes into the state of a horny transparent mass, but is not decomposed by the combined action of charcoal and heat. It is, however, decomposed by passing over it a current of hydrogen gas, with the formation of muriatic acid.*

Iodide of Silver.—This is a compound formed by adding to a solution of nitrate of silver a solution of the hydrodate of potash. It has a greenish yellow color, and is insoluble in water and ammonia.

In combination with the ferocyanate of potash the iodide of silver forms a highly sensitive preparation, which will blacken almost instantly under the influence of the sun's rays.*

Ioduret of Silver.—This is the compound formed during the process of coating the Daguerreotype plate over dry iodine, which, as we all know, is a very essential part of the business of Daguerreotyping, and on which it principally depends.†

Bromide of Silver.—We can find no directions for the preparation of this salt. In itself it possesses very slight photogenic application, but when mixed with the least quantity of nitrate of silver it is very susceptible of change. In the Daguerreotype process the bromo-ioduret of silver is formed upon the plate during the second coating, which renders the action of light in the camera much more energetic.‡

Fluoride of Silver.—The combination of silver with fluoric acid has been very little examined, but Mr. Robert Hunt has succeeded in producing a very pleasing and easy method of photographic manipulation with this salt which he calls the Fluorotype. The process will be found described on page 90, vol. I., Photographic Art-Journal; and also on page 51, vol. III.

Nitrate of Silver.—This salt is indeed a valuable agent in the photographic art, when in combination with organic substances, although by itself it is nearly useless on account of its insensibility to light. We are principally indebted, we believe, to Mr. Fox Talbot, Mr. Robert Hunt and Sir John Herschel, for its first successful applications to the art.§

The nitrate of silver is prepared by digesting pure metallic silver in one and a half times its weight of nitric acid diluted with water, and evaporating the solution to dryness, when the dry mass is dissolved in less than its weight of hot water, and as the solution cools, crystals of a tabular form are afforded. In this instance a portion of the nitric acid is decomposed, furnishing oxygen to the silver, which, combining with the undecomposed acid forms the nitrate of silver in solution, and nitrous acid is given off in the form of gas.

When nitrate of silver thus prepared is *fused and run* into cylindrical moulds it forms the lunar caustic of the shops.—These sticks of caustic are generally found of a dark color and crystaline texture; the color depending upon the vegetable or animal oil with which the moulds are greased, in order to facilitate the removal of the caustic, and the consequent decomposition of a portion of it, giving off nitric acid, and depositing the black oxide of silver. By using polished silver moulds the lunar caustic may be obtained perfectly white.

Nitrate of silver for photographic purposes is obtained in small clear crystals. When pure it is soluble in its own weight of cold water, and half its weight of hot, and also in four times its weight of alcohol, yielding a colorless solution from which pure

* For the application of this salt to Photography, its prismatic analysis, and further description, see vol. 1, P. A. J., pages 66 and 67.

* See, also, Photographic A. J., vol. 1, page 75.

† Photographic A J., vol. 1, page 80.

‡ Photographic A. J., vol. I. page 88.

§ See Photographic A. J., vol. 1, page 65.

silver is precipitated by plunging into it a piece of bright copper. Its constant use discolors the skin. Its antidote is a solution of common salt.

Oxide of Silver.—This oxide may be obtained by adding to a solution of the nitrate of silver pure barytic water, or lime water. It may also be obtained from its solution in nitric acid by the addition of the pure alkalies. In either case the oxide is precipitated in the form of an olive brown powder, which is changed to a more decided brown by exposure to light. It is insoluble in water, but dissolved by ammonia, and reduced by a strong heat. When oxide of silver—freed from moisture by bibulous paper—is put into a solution of ammonia and allowed to stand for some hours, the greater part will be dissolved, but a portion remains at the bottom of the vessel of a black color, which is a compound of ammonia and oxide of silver; this is fulminating silver, detonating violently either by heat or percussion.

The oxide of silver may be used photographically, but the results are not of sufficient interest or advantage to induce its employment. It is, however, used extensively in daguerreotyping, in the formation of silvering solution for galvanizing plates.*

Cyanide of Silver.—This is a white powder, soluble in ammonia, and decomposed by contact with neutral vegetable substances. By exposure to light it turns violet-colored. It may be prepared by adding dilute hydrocyanic acid to a solution of nitrate of silver as long as a precipitate falls down. Wash and dry. The proportions ordered by the London College, are two ounces and two drachms of nitrate of silver dissolved in one pint of water; adding sufficient hydrocyanic acid to precipitate the cyanide.

Phosphate of Silver.—A compound resulting when the phosphate of soda is added to the nitrate of silver; double decomposition ensues, the phosphate being precipitated whilst the nitrate is held in solution. This salt was first applied to photographic purposes by Dr. Fyfe. Papers prepared with it answer a very good purpose for copying by application, but they are entirely useless in the camera.

Carbonate of Silver.—To a solution of nitrate of silver add gradually any alkaline carbonate in solution as long as any precipitate falls down, the result being carbonate of silver, which is of a white color.

Sulphuret of Silver.—This salt may be prepared either by boiling metallic silver in sulphuric acid, or by adding to a solution of the nitrate of silver, a solution of the sulphate of soda. In the first case one portion of the sulphuric acid is decomposed, giving to the silver an equivalent of oxygen, and giving off sulphurous acid gas. The oxide of silver thus formed combines with the sulphuric acid, and the compound under consideration is the result. In the second instance the product is the consequence of double decomposition.

Sulphuret of Silver, Is prepared by passing sulphuretted hydrogen through a solution of nitrate of silver.

* See Phot. Art-Journal, Vol. 1, pp. 112.

From La Lumiere.

INSTANTANEOUS PRODUCTION OF DAGUERREAN PROOFS.

New method of preparing negative paper.—New method for obtaining positive proofs on paper.—Accidental colors that result from gazing at white objects.

Translated from the French, by J. R. Snelling, M. D.

THE revelation of Mr. Talbot's accelerative process, and the communication of two notes from M. Gustave Le Gray, have given great interest to the last two meetings of the Academy of Science. We copy here, the letter of the illustrious English photographer, as sent to the Academy, without altering it or making any comment, in order not to change the ideas of the author. He expresses himself as follows:

" Last June I had the honor of writing to the Academy that I had succeeded in obtaining the photographic image with a disc bearing printed characters, and turning with a very great rapidity, by lighting it momentarily with an electrical discharge. I had therefore intended to send soon to the Academy a description of the method by which I obtained this result. But a few days after, I concluded to leave for Prussia, in order to view the total eclipse which occurred on July 28th. This observation was quite satisfactory, the details of which I shall have the honor to send to the Academy. I mention it here as an apology for the unexpected delay in sending the details of my photographic experiment. My travels in Germany lasted quite long, and since my return, circumstances have prevented me from concluding this little memoir at an earlier period.

" I will now give the method by which we can impart to plates of glass the extreme sensitiveness necessary in order to succeed in this experiment

" 1. Separate the clearest part of the white of an egg, and mix it with an equal volume of water; spread it on the plate of glass in the most uniform manner possible, and then dry it well by the fire. An intense heat even, applied to this first coat, is not hurtful. The dried albuminous coat should be scarcely visible.

" 2. To an aqueous solution of nitrate of silver add a strong proportion of alcohol, so that there may be three grains of nitrate to the ounce of alcoholic mixture. I have tried several proportions, from one grain to six, and finally limited myself to three grains. However, it is necessary to make exceptions, because the proportion influences the result a great deal.

" 3. Plunge, for some moments, the albumenized glass in this weak solution of silver; then withdraw it and let it dry spontaneously. After this is accomplished, we may perceive upon the glass feeble prismatic colors. It is easy to ascertain when the nitrate of silver is chemically combined with the albumen by being rendered hard and insoluble in the liquid which should first act upon it.

" 4. Wash with distilled water, in order to remove the excess of nitrate of silver. Then spread upon the plate a second coating of albumen, similar to the first; but it must be dried with less heat, otherwise the silver would begin to decompose. I have endeavored to set aside this part of the operation, (No. 4), but the results have been very imperfect.

" 5. To an aqueous solution of proto-iodide of iron, add first an equal volume of acetic acid, then ten volumes of alcohol. Let this mixture remain for two or three days. At the end of this time, the iodide changes color, from yellow it becomes of a fawn color; at the same time the odor of the acetic acid and alcohol disappear, and the liquid acquires an agreeable and somewhat vinous odor. This is the state in which I prefer to employ it. It is the only instance, I believe, up to the present time, of the employment in Photography of a liquid odorant; but I would not hazard the

assertion that this peculiarity plays any part in the phenomena.

"6. Plunge the plate of glass in the iodide thus prepared, for a few minutes only, just sufficient to give a yellowish tint. All these operations may be made with the light of day—avoiding, however, the direct rays of the sun.

"7. Make an aqueous solution of nitrate of silver, containing nearly seventy grains in an ounce of distilled water. To three parts of this solution add two parts of acetic acid. Plunge the plate of glass quickly once or twice in the solution of silver This operation soon gives it a very great sensibility. There must not be too much delay before placing it in the camera.

"8. Withdraw the plate from the camera. It then remains to render the impression, which it invisibly bears, apparent. For this purpose, it is necessary to use a solution of protosulphate of iron. To one part of a saturated solution of sulphate, add two or three parts of water. Fill a vessel with it, and plunge therein the glass which has been impressed with the invisible photographic image, which done, the picture will immediately appear.

"9. Having washed the plate, pour on a solution of hyposulphite of soda, which acts rapidly on the proof which is obtained, carries off a kind of veil that might cover it, and blazons forth the picture with fresh *eclat*.

"10. Wash a second time with distilled water, which finishes the operation. Nevertheless, for perfectly securing the picture from accidents and from the moisture which might destroy it, we may cover it with a coat of varnish, or with albumen itself.

"This operation may appear long; yet we can execute it quite rapidly with a little experience.

"The image thus obtained on glass presents peculiarities which deserve to be pointed out. In the first place, although it may be negative when viewed by transmitted light; yet it is positive, looking at it obliquely, by the reflected light from the sky. It has, in common with the daguerrean image the property of appearing by turns positive or negative, according to the light under which it is viewed. At the period when I discovered this phenomenon I thought it sufficiently remarkable to entitle it to a distinctive name. I then proposed, for these images the name of *amphitypes*, in order to express that they have a double nature—positive and negative at the same time. Since that period, a new photographic process has been made known, which produces similar images by means of collodion. This process and mine may be classed alike in the same group of photographic processes. But really, I ought to mention a peculiarity which distinguishes my *amphitype* proofs, (if such I may be permitted to call them,) which is, that the coating impressed by light is so hard, and the image so forcibly impressed, that in the last washing, No. 10, we may rub it even quite hard with cotton saturated with water, which only increases its brilliancy, by removing all particles of dust and other impurity; whereas if we attempt to rub in this manner the image obtained by collodion, it instantly disappears; this likewise occurs with those images which we obtain by most of the photographic processes known, and which do not acquire durability unless they are well dried and covered with some protective coating.

"We now take an *amphitype* proof. By viewing alternately its positive image and that which is negative, the principal thing that strikes us, is, that the first is at least ten times more distinct than the second. We may even carry this difference farther, for it is not uncommon to have plates upon which the image is almost imperceptible by transmitted light, but which notwithstanding is seen perfectly designated, brilliant and full of details, by reflected light.

"The repetition of the coating of albumen which I have recommended (No. 4,) is principally to obtain this image reflected positive. This is truly an extraordinary matter, for by changing the proportion of the chemical agents employed, we can obtain the image at will, however definitive it may be, either entirely negative or almost entirely positive. This last method should be chosen for experimenting with the revolving disc, the transmitted image not being sufficiently visible in this experiment except by making use of a very powerful electric discharge. I pass on now to another peculiarity which is noticed in these images. Until the present time, I have always thought that a photogenic image

must be either positive or negative, and that there was no intermediate phases. But a third kind of image, new and unexpected, appeared among the amphitype images, and justified—I hope so at least—the name which I have given it. To explain, I must repeat that the image generally appears negative by transmitted light, and positive by reflected light. However, when we vary the inclination of the plate, we readily succeed in finding a position in which the image is positive, and even very luminous, although produced by transmitted light. This is a matter which at present merits an explanation. But that which is very singular, is, that in this new image, which I denominate the *positive image by transmission*, the clearest objects (that is to say those which are really so, and which would appear in the image *positive by reflection*), fails entirely. The picture appears as if it were pierced, and we see through the holes objects which are placed behind. If this singular appearance presented itself in all the positions in which the image is formed positively, I should seek for the cause in the action of a too intense light, which might have diminished or annulled the photographic effect which it had first produced. But since the effect manifests itself alone in the image *transmitted positive*, and not at all in the image equally positive but reflected, I confess my inability to explain the reason of an optical effect so singular. Numerous experiments carefully made can alone unveil this part of science depending upon molecular philosophy.

"I have neglected to say, that in making these experiments in winter, it is necessary to heat the plates moderately before introducing them into the camera.

"The delicate experiment of the turning disc succeeds alone with the iodide of iron in a certain chemical state. This substance presents variations and anomalies which have a great influence upon the results. This consequently is the point upon which those who would desire to repeat my experiment must chiefly bestow their attention. In pursuing these experiments, I have been astonished at the vast field which the science of optics covers on all sides. By treating the albumenized plates of glass with different metallic solutions, &c., we obtain the most splendid colors, 'the fine waves' of Newton. It often happens thus that the proofs which we withdraw from the camera-obscura are colored, but these colors are not those of natural objects, and are in that respect useless.

"There is, however, an exception; this is the color of the sky, which was reproduced several times in my experiments with a very natural azure tint.

"H. J. Talbot.

"*London*, Nov. 24, 1851."

M. Regnault has presented on behalf of M. Gustave Le Gray, a new method of preparing negative paper, which we transcribe here after the note itself of the author.

"Keep virgin wax melted at a temperature of 100° in a large dish; plunge the paper therein, and let it remain until it becomes completely imbued. Then withdraw it, and after placing the sheet between several folds of blotting paper, pass over these a moderately hot iron, which effects the absorption of the excess of wax by the blotting paper. A sheet well prepared presents no glossy point upon its surface, and possesses a perfect transparence. This waxed paper is plunged into a hot solution of—

Rice water,	1000 grammes,
Sugar of milk,	40 "
Iodide of potassium,	15 "
Cyanide of potassium,	0,80
Fluoride of potassium,	0,50

After letting it remain half an hour, withdraw the sheet and dry it by hanging it up by one of the corners. The sheet is then plunged into a clear solution of aceto-nitrate of silver formed by—

Distilled water	300 grammes,
Nitrate of silver	20 "
Crystallizable acetic acid	24 "
Charcoal	5 "

"The charcoal renders the paper more sensitive; it discolors the solutions whenever it is used.

"The sheet ought to remain three minutes in this solution; and to ensure the contact of the liquid we rub the two surfaces with a brush. The paper is then washed several times with distilled water, and finally perfectly dried between blotting paper.

"After these two preparations, the paper may be immediately transferred to the

camera. It may be kept without change for more than fifteen days in a dark place. In this respect it presents great advantages over all photographic papers known up to the present time. After the exposition in the camera, it is not necessary to develop the image immediately with gallic acid. We may wait with impunity until evening and even until the next day, or the third day. Every one will understand how much this new process facilitates operations in traveling. The solution of gallic acid is composed of—

Gallic acid,	1	gramme.
Nitrate of silver,	0,5	"
Distilled water,	200	"

The proof, as usual, is fixed with the hyposulphite of soda."

We have also opened a sealed package from the same author, containing the "New processes for obtaining positive proofs on paper, with an extremely varied coloring, and with a more complete fixedness than by the old." We hope we shall be able in a short time to procure this note, which is too lengthy to be reported in this connection, and too interesting to allow of our being content with a simple analysis. We shall, therefore publish it entire.

We would also announce, that we intend to make known at a later date, a curious work of M. Seguin, Professor of Philosophy at Caen, upon *the accidental colors that result by gazing at white objects.* The author has resumed the experiments of Plateau and Fechner, and thinks he has succeeded in discovering the laws which govern the manifestation of colors.

G. Govi.

A TREATISE ON PAPER PHOTOGRAPHS.*

BY M. BLANQUART EVRARD.

Translated from the French, by J. R. Snelling, M. D.

CHAPTER VII.

FORMATION OF THE NEGATIVE PROOF UPON PLATES OF GLASS BY THE DRY AND BY THE WET METHOD.

IODIZED albumen, spread upon glass, according to the process described in Chapter IV., does not acquire the photogenic property, until it has been submitted to the aceto-nitrate of silver, when the iodide of potassium passes to the state of iodide of silver. Albumen does not perform any chemical part in the reactions; it is nothing more than a medium in which the photogenic salts are suspended.

Papers entirely different, which are composed of vegetable matters, of glue, and sometimes of certain salts, become susceptible of alteration under the action of chemical combinations, and the albumen remains inert in the whole course of the reactions; it is its physical state alone which should engage our attention.

Albumen becomes insoluble when heated above seventy degrees; the acetic acid which enters into the preparation of aceto-nitrate of silver, produces the same effect as an elevation of temperature, and it is upon this property which depends, in a great measure, the advantages of employing albumen.

But in coagulating, the albumen contracts, and the whole coating of albumen must undergo, at the same moment, this change of state, by which it is divided and forms many sections unless there has been time for a pause in the operation.

We cite an example:

If upon a sheet of glass covered with albumen, we let fall several drops of aceto-nitrate, it effects a partial contraction, and collects the albumen at the place where the drops have fallen.

The first precaution which we ought to take when we submit the albuminous glasses to the aceto-nitrate, is to plunge them all at once in the solution, for, otherwise, the coating would present solutions of continuity, inappreciable as might be the intervals of movement.

If we had a great number of glasses to prepare, it would be better to have a vessel sufficiently deep, in which we plunge vertically and successively all the glasses.

In default of this method, which requires a special apparatus, we have heretofore described a method also simple and convenient, and which possesses the advantage of not increasing the daguerrean apparatus, since the same basin which we use for this purpose will answer for other operations.

This method consists in pouring into a basin with a tight fitting bottom, a coating of aceto-nitrate nearly a demi-centimetre thick; by giving the basin an inclination with the left hand the liquid runs down to the opposite part; we then take the glass in the right hand, the albuminous side towards the liquid; by a two-fold movement we let the glass fall into the basin, and lower this upon the table. If these two movements are well combined, the albumen of the glass is coagulated at a single dash; and its surface will not present any solution of continuity.

If the bottom of the vessel were not perfectly united, we would have reason to fear an alteration of the albuminous coating. To prevent this accident, it is sufficient to place in the bottom of the basin, and against the lower margin a little soft wax, in such manner that the glass, in falling upon the bottom may be protected at its inferior extremity, and remain suspended several millimetres above the bottom of the basin; while the iodized papers are only impregnated by degrees with the aceto-nitrate of silver, according to the nature of their consistence, the albumen which we spread upon glass instantly enters into combination with this body. It must, therefore be withdrawn as soon as possible from the aceto-nitrate bath.

When the glass touches the aceto-nitrate the albuminous coa·ing becomes photogenic, and may be exposed immediately in the camera-obscura; but if we are obliged to wait before using the glass, it is necessary, after withdrawing it from the basin to submit it to distilled water, which is done by letting the glass fall into a basin half filled with distilled water—the albuminous side up; we briskly shake the glass, in order to hasten the solution of the superabundant part of aceto-nitrate of silver which has not combined with the albumen.

It is essential, in order not to diminish the photogenic sensibility of the albumen, to wash the glass in a very small quantity of water, and to refrain from this washing as soon as the water ceases to form a variegated surface upon the albumen.

When the glass is washed, it may be exposed to the camera-obscura, either immediately in the wet state, or from ten to fifteen days after, in the dry state. In this last case, attention must be paid to guard it with the greatest care from the light.

It is equally necessary in both instances, to drain off the water from the albuminous coating when we withdraw the glass from the water in which it is washed; for this purpose, it will answer to take the glass and strike one of the corners for some time on the table on which we operate; all excess of liquid runs off by this corner, and the coating dries uniformly.

If the glasses are intended to be used at a future period, they must be suffered to dry completely, and then placed in a grooved box, or instead of this box, in a book of white paper—each glass in a separate fold, and the book itself then put in a pasteboard box. In every case, and whatever process may be resorted to, it is necessary to see that the surface of albumen is not changed by the contact of a foreign body.

When we use the glasses immediately after their preparation, the albuminous coating must not be suffered to dry; as soon as it has been shaken as we stated, to free it from the small drops of water which might remain upon the surface, it will be well to place it in the holder of the camera-obscura, and to keep it there horizontally until the moment of exposition, in order to preserve a perfectly uniform moisture upon the whole surface of the sensitive coating.

We satisfy ourself that the holder lid of the camera-obscura is perfectly clean, and free from particles of dust and drops of water, which might fall upon the albumen and form spots.

Before laying the albumenized glass in the holder of the camera-obscura, the operator can decide upon the qualities of his preparation, as the albumen under the action of aceto-nitrate acquires a pearly appearance ; viewed by transparence in the light of a candle, it is easy to ascertain if the coating is perfectly uniform and pure, and to perceive the slightest defects, which are generally less serious than we would be induced to suppose from their appearance.

When a glass is altered in one of its parts, it may be still rendered useful by restoring the image in the part which has remained intact.

Albumenized glasses are little sensitive to the action of light; to disengage a good proof, there must be an exposition of more than a quarter of an hour to the sun.

It follows that we cannot employ this process except for inanimate objects. The results will be rendered with more or less perfection, according as the models are more or less clear.

We stated in Chapter III., all the difficulties attendant upon too vivid lights.

A vivid light has the double inconvenience of hastening the impression of the clear parts and retarding the impression of the shades.

We have overcome this disadvantage by operating with a very feeble light and consequently prolonging the time of exposition. When the exposition is pushed very far the image is apparent upon taking it from the camera. It is then preferable to use a very dilute solution of gallic acid for the purpose of giving the requisite intensity, instead of a saturated solution, as in ordinary cases.

If the image be very plainly visible upon withdrawing it from the camera-obscura, the glass must be washed copiously with water before it is submitted to the gallic acid. In this instance, the glass must be suffered to remain in the gallic acid bath a very short time. The effect of the gallic acid being sensible to the eye, the operator easily estimates the moment when the proof should be removed from its action.

We now come to speak of the results obtained in contrary conditions.

When the exposition takes place with a soft light and in cold weather, the albumenized glass, even after being left some time in the saturated bath of gallic acid, does not reveal the image. The glass does not change its appearance. It is then only sufficient to add a few drops of aceto-nitrate to make the image instantly appear and to develop it even beyond the necessary point. It is necessary to resort to this means with extreme caution, for should we add too much aceto-nitrate to the gallic-acid bath, or should the albumenized glass remain some time under the influence of its action, the proof would be very seriously compromised.

The albuminous coating might become perforated in the darks of the image, that is to say in the parts most vividly impressed by light, and afterwards by the aceto-nitrate. This perforation, which is not visible except by holding the proof to the light of a candle, produces upon the positive proofs, a dark dot which deeply alters them.

If we let the glass remain very long in the bath of gallo-nitrate of silver, a too great intensity of the dark parts may result, so that the proof would totally, or at least partially, lose its transparence.

The lights would be revealed with too much intensity and bareness. The picture would then be objectionable from a want of harmony.

If we attribute such great importance to these suggestions, it is because we know by experience how impatient operators become when they are obliged to wait several hours for a result which may be obtained in a few minutes. However, there is everything to gain by delaying, for a proof which is developed slowly with gallic acid frequently attains an admirable perfection. But this wise caution is not always possible, as there are proofs which have been obtained by a too feeble light to be developed without the conjunction of an energetic chemical agent. The use of aceto-nitrate then becomes very valuable, only it is necessary to watch its action and moderate it. Experience alone may inform us of the occasion and the degree in which this method must be employed.

Instead of appearing in the gallic acid

bath much more intense than they are in reality—which occurs for negative proofs on paper, simply prepared with iodide of potassium—the proofs on glass are at least as powerful again as one would be led to suppose from their appearance, consequently they must be removed from the action of the bath, before they have time to become too much revealed.

Moreover, if they are too feeble, even after producing the positive proofs, there would be no reason why they should not be submitted anew to gallic acid, in order that they may obtain the necessary degree of coloring.

The addition of a drop of aceto-nitrate to the gallic acid bath will be attended with a very good effect.

FIXING THE NEGATIVE PROOF ON GLASS.

As soon as the albumenized glass is removed from the action of the gallic acid bath, it should be washed freely with distilled water, and then laid in a basin containing a solution of bromide of potassium. The quantity of bromide of potassium is a matter of indifference. If the solution is weak, we let the proof soak a longer time; if it is concentrated, one minute will answer for the absorption of all the silver salt which remains uncombined upon the albuminous coat. In order to save this quite expensive substance, we may place a small quantity in the basin and shake it when the glass is put in, so that the solution may be applied on the whole surface of the proof. At the end of one or two minutes, the solution of bromide acquires a green color, resulting from its combination with the salts which the proof already contains.

When the glasses have been prepared but a short time—not long enough for the albumen to become dry, a kind of blister is formed upon the proof, when we soak the glass in gallic acid, and the only means to avoid this accident is to hasten all the operations and finish the proof in a shorter time.

After submitting the proof to the bromide, wash it freely with water and dry it by standing it on one of its corners, to facilitate the draining of the liquid and the activity of desiccation. It is advisable to dry the glasses in the camera, because if the washings were incomplete, the proof would be more readily changed by light.

So too, if blisters were formed in the albuminous coat, it would be necessary to leave the proof in more profound darkness. We must, therefore, even submit it again to the bromide, after once drying it.

The second plunging into the bromide and the subsequent washing, must be executed as rapidly as possible, to prevent the reappearance of blisters, which would inevitably occur if they remained long in the baths.

ACCELERATIVE METHODS.

Iodized albumen is less sensitive to the action of light upon glass than upon a sheet of paper.

By searching for the reason of this difference, we find that it is due to the fact that the albumen acquires upon the paper a porosity which disposes it to the photogenic action, while that spread upon an impermeable body has a compactness which affords an obstruction to the action of light through the albuminous coating.

This resistance to the photogenic action is still increased, if, instead of exposing the glass in the camera, when the albumen is still moist, we let it dry.

On the contrary, by softening it by means of some chemical agent, we increase the porosity, the reagents penetrate it with more facility and its sensibility increases.

It follows from these observations that if extreme sensibility is still required for the salts, which we are about to describe, and which are combined with the albuminous coating, we have only to simply soften this albumen.

If we pour into the bath of distilled water in which we wash the glass, upon withdrawing it from the aceto-nitrate, five or six drops of a saturated solution of fluoride of potassium it becomes so sensitive, that it is instantly impressed in the camera obscura, that is to say as soon as the object glass is unmasked.

When we use the glass with gallic acid for fixing the image, we experience great difficulty. The albumen is carried off from a part of the glass, and often to the extremities.

By taking care not to shake the glass in the gallic acid bath, we diminish the cause of these accidents, which we may even remedy completely and without leaving any trace thereof by operating with dexterity.

For this purpose, we plunge the glass, on withdrawing it from the gallic acid bath, into a very concentrated solution of bromide of potassium, or better still, into an old solution of hyposulphite of soda.

All these baths, and particularly that of hyposulphite, have the property of making the albumen adhere which was detached from the surface of the glass.

Nevertheless, if the proof is not liable to become spoiled; the fluoride, if it is employed in too great proportion, dries the albumen in such a manner, that it cannot be exposed to the contact of dry air or of air slightly warm without being cracked and wholly detached from the glass.

It is necessary, therefore, in order to preserve these proofs, to dry them in a damp and dark place, and exert upon them afterwards a strong pressure by laying over them a sheet of paper upon which we place a very heavy glass.

We will hereafter describe how to secure this frail image, and within what limit we may expect a good result. We think we have reason to be a little cautious in operating on glass, in view of all the accidents to which it is exposed However, we may avoid a part of the accidents, by diminishing the quantity of fluoride. By reducing the portion to a single drop, we obtain a glass fifteen or twenty times more sensitive than it would be without the presence of this body, and we have no longer any fear of losing the proof during or after its development.

We shall be obliged, therefore, to ascertain by experience the proportions which it is proper to employ, according to the effects which we wish to produce and the time of exposition necessary for affecting it. We could perhaps, by means of some new body, prevent the desiccation of the albumen.

We certainly could have wished to complete this investigation, before delivering this chapter to the press; but with the birth of an art like that which occupies our attention, if we should wait for the solution of problems before we placed our essays before the public, we would be doomed to keep indefinitely to ourselves the results of experiments the knowledge of which may greatly contribute to useful advancement, with the concurrence and skill of amateurs to whom we impart them.

There is no cause for alarm if we observe that the bath which contains a little fluoride, acquires a milky tinge when we plunge the albumized glass therein: this milky appearance is owing to the fluoride of silver which is formed; by shaking it violently and draining off all excess of liquid, as we have previously remarked, no accident will result.

Cyanide of potassium has properties almost as accelerative as the fluoride, by employing it under the same conditions.

Its action upon the albumen is less corrosive; and the proportion may likewise be increased.

The addition of five or six drops of a saturated solution of cyanide are sufficient in the bath to give to the albuminous coating upon glass an extreme sensibility. The precipitate which is formed when we plunge the glass in the bath, is very abundant, but by violently shaking the basin we see that it is gradually dissolved.

We then remove the glass and drop it in the manner as heretofore described.

The quicker the manipulations are executed, the richer does the coating become.

These accelerative methods require the exposure of the glass in the camera while the albumen is yet damp. Should it be permitted to dry, the albumen would be altered, and the result of the operation would be compromised.

Papers prepared as we described in chapters IV. and VI., acquire a greater sensibility if we add a little cyanide of potassium to the iodide bath.

Yet by a very remarkable anomaly, the fluoride of potassium, which gives such a great sensibility to the albumenized glasses, without producing spots, cannot up to the present time, be used in the preparation of papers, in consequence of the accidents to which it gives rise.

CHAPTER VIII.

PREPARATIONS OF PAPERS FOR THE POSITIVE PROOF.

PREPARATION WITH THE CHLORIDE OF SODIUM AND NITRATE OF SILVER.

Dissolve one part in weight of chloride of sodium (marine salt—" common cooking salt,") in ten parts of distilled water;

then filter, and pour the solution into a vessel large enough to receive the paper.

Lay each sheet of paper on the surface of the bath, and prolong the contact until the sheet is perfectly depressed; two or three minutes answer if the paper is not too thick; every sheet is dried with blotting paper, which is renewed until the drying process is completed, in the same manner as was described in the preparation of negative paper.

Into another vessel that contains a solution of one part nitrate of silver, and four parts distilled water, lay the surface of paper which has imbibed the marine salt; the moist state of the paper facilitates capillary action; the nitrate of silver combines with the chloride of sodium, and forms chloride of silver. Thus, while we are drying a second sheet of paper, the first can be submitted to the silver bath.

Lift the sheet by the corner, upon withdrawing it from the bath, so that the liquid may not wet the back of the sheet: drop it into a basin, in order not to loose too much of the liquid, and lay it afterwards on a very even and impermeable surface, with the wet side turned up.

We see that by thus passing the paper successively from the salt bath to the bath of silver, the operator does not lose a minute, and that he can in a few hours prepare quite a large number of sheets of paper.

But this very expeditious manner of preparation, is not practicable except in the employment of paper of ordinary strength; the thick paper *creases* upon the salt bath, and it requires a considerable time to settle down and become uniformly impregnated.

When we operate with thick paper, the process must be modified accordingly.*

We replace the dish which contains the solution of marine salt, by a deep vessel into which we vertically plunge each sheet of paper.

A few hours are necessary with this kind of paper for sufficient absorption to take place, and it may be left to soak in the salt bath a whole day without any injurious effect occurring therefrom. When it is laid in the bath we must take care that there are no air bubbles interposed between the liquid and the paper surface, and nothing to prevent this from being uniformly moistened; if we take this precaution, the bath may receive as many sheets of paper as the capacity of the vessel will admit of.

Before submitting the paper to the nitrate of silver, it must be dried very carefully with blotting paper, and left at least an hour upon the silver bath.

To render this preparation easier, and consequently more practical, we may pursue the following course:

After an immersion of five or six hours in the bath of marine salt, all the soaked sheets are dried with blotting paper, and piled one upon the other, always placing a sheet of blotting paper between them. The whole is then shut up in a book of damp paper or in a carton, in order to keep the salted paper in a state of moisture as uniform as possible and exclude the external air.

We afterwards lay it upon several baths of nitrate of silver, according to the quantity of paper which we wish to prepare. We lay each sheet of paper on a separate bath, and leave the operation to itself, until such time as we replace the paper.

The duration of the contact has no influence on the quality of papers, whether the contact lasts less than one hour, or more than five or six. We may even put it at eight days if we wish, for exhausting the mass of salted papers; in this manner we establish a permanent preparation of positive paper without taking any other precaution than simply renewing from time to time the absorbing papers upon the silver bath.

It is necessary to select for this operation a place which is damp and cold; air which is dry and warm would have the effect of partially evaporating the silver bath.

A sufficient quantity of liquid must be put into the bath to allow the paper to float.

Every time we lift a sheet of paper from the bath, we add to it a quantity of liquid equal to that which has been absorbed, so

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* We mean by thick paper, the Bristol pasteboard, but of a particular consistence; there exists in commerce a paper manufactured by Canson Brothers, at Annonay, large folio size, at the price of 6 or 7 fr. 50 cent. per quire, and used for writing books in the schools and administrations.

We take this paper for our sample, and pronounce it perfectly suitable for positive proofs.

as to obtain it always in the same conditions.

Whatever manner of operation we prefer farther, it is always necessary to be certain that the bath of silver remains perfectly limpid, and that its surface is free from every impurity.

When the salted paper has been imperfectly dried by the blotting paper, the baths of silver are rendered turbid; flakes of chloride of silver are formed which change the composition. When this accident is produced, the operation must be arrested, the bath filtered, and a few crystals of nitrate of silver added to replace that which was lost.

We have already stated that the paper should be placed in a dish to dry; upon withdrawing it from the bath. By acting thus, we render beneficial to the proof, all the chloride of silver which has been dropped upon the bath: it is consequently essential that the support upon which the paper is laid should be perfectly horizontal and impermeable, in order that the chloride of silver may be uniformly distributed, and not collected in different points, thereby producing spots or irregularities of impression upon the positive proof. For the same reason we ought to let the paper dry slowly.

To preserve as long as possible the whiteness of the positive paper, it is necessary to keep it in a damp place completely screened from light; but care must be taken to have it dry before using.

When the glasses, or the holders are damp, spots are formed on the negative proof; to avoid these accidents which we commonly attribute to the bad quality of paper, it will be sufficient to expose the glasses and the holders to the air before using them.

PREPARATION OF POSITIVE PAPER WITH CHLORIDE OF SODIUM IN ALBUMEN.

Beat the white of eggs into a foam, into which pour twenty-five times its weight of a saturated solution of common salt, or if you wish—four grammes of salt and ten grammes of distilled water for each white of egg.

When the mass has passed to the state of foam let it lie until it again becomes liquid; then filter through very fine linen or silk paper.

The paper upon which we spread the albumen should be thick. Raise the four edges of each sheet, as we described for a similar preparation of negative paper. Dry each sheet of paper upon a plate of glass perfectly flat, and pour in an excess of albumen, so as to cover all the bottom. Then give the glass several to and fro movements to agitate the albumen and prevent the formation of air bubbles which would render the adhesion of albumen incomplete.

Drain off by one corner all the excess of albumen into the vessel in which it has been prepared, and dry the paper by fastening it with a pin to a ribbon which is tacked up horizontally.

The time of making this manœuvre suffices to secure to the paper the requisite coating of albumen. This preparation is made in broad daylight. If the apartment is not damp, the albumen has time to dry in fifteen minutes, and the paper may then be submitted to the nitrate of silver.

This second phase of the preparation should be made in every point as we have indicated for the thick saline papers, that is to say, the albumenized paper ought to remain at least an hour upon the bath of nitrate of silver in order to be sufficiently saturated with this salt.

We perceive that the preparation of paper with albumen is infinitely more suitable and easy than the preceding, because it dispenses with the trouble, always laborious, of drying the salted paper with blotting paper.

Neither have we any cause to fear the difficulties which papers badly dried produce in the bath.

The use of albumen is also remarkably economical as it absorbs less nitrate of silver.

We may prepare the paper in advance, and in case the albumenized paper is not passed to the nitrate of silver except in proportion as we wish to execute positive proofs, the paper can be preserved indefinitely by excluding moisture from it.

Whatever time may elapse after the paper is covered with albumen; whether its preparation is remote or recent, it acts in the same manner on the silver bath.

When we employ albumen, thick paper may be used, which we have hitherto recommended; the advantage which it pre-

sents over thin paper, is that the albumen spreads more readily over its surface ; it is also prepared much better, and keeps a longer time.

When positive papers have been prepared a long time, and kept in a cool place, they are colored grey ; but sheltered from moisture, they preserve their whiteness more than a month, and are excellent for use. We will describe hereafter, when we treat of the character of positive proofs, all the advantages we can procure from thick papers which acquire the gray color of which we are about to speak.

The more simple, easier, and less expensive preparation of papers with albumen, should not exclude the use of saline papers, since it is not suitable for all subjects. Proofs upon albumenized paper have a greater warmth of tone, more transparence and delicacy in the details ; but in their turn, salted papers give to the proofs an appearance of design, or of *aqua-tint* engraving—a mysterious void which we love to discover in works of art, since they then address themselves as much to the soul as the senses—as much to the mind as to the eye. Compositions from nature,—portraits, &c., landscapes with the grand effects of perspective, will be more beautiful with salted papers ; but albumenized papers claim the advantage, when natural objects of history and monuments are to be reproduced, for which precision of detail, and delicacy of outline, are the most essential qualities.

CHAPTER IX.

FORMATION OF THE POSITIVE PROOF.

To obtain a positive proof, the impressed side of the negative proof is placed on the surface of positive paper, prepared as described ; the two sheets are kept one against the other in a frame between two glasses, and this frame exposed to the light of day. The negative is traversed by light, and the paper of the positive proof is discovered to be darkened on account of the facility with which the colored parts of the negative obstruct the light.

The design which is produced on positive paper is consequently reversed from that of the negative proof, since the white parts let the light pass, and the darks afford an obstacle to it by reason of their intensity.

The principal condition for obtaining a positive image perfectly clear, is to place the positive paper in close contact with the negative image.

If the contact were imperfect, the light would extend beyond the proper points, and the image would be dimly shown.

To arrive at a good result, it is therefore not sufficient simply to place the positive paper under the negative proof, but it is also necessary to shut them between two glasses, and exert as strong pressure as possible upon it to render the contact more perfect.

We find in the trade an apparatus for photography on paper, constructed after the instructions of M. de Valicourt. It is composed of a wooden frame, in which a groove is made deep enough to receive two thick glasses, and a small board to cover over them ; these grooves and this small board are lined with cloth ; a series of screw pins are used to keep the glasses compressed together when the two papers, positive and negative are interposed.

This holder is generally adopted. Care must be taken to choose glasses very thick and effect pressure very equally by the screw pins, without which the glasses would be broken, or at least a defective proof would be the result, for the pressure not being uniform upon the whole surface of the design, the clearness of the image would be imperfect.

This process is only applied to proofs on paper ; for proofs on glass, we simply employ two glasses on which we place the paper. The increased weight of the glass, which we choose for a somewhat heavy design, suffices to keep the paper perfectly extended.

We may also employ this process with negatives on paper. In this case, we extend the positive paper on glass, cover it over with the negative proof, and lay upon the whole a second glass ; the weight of the glass preserves the contact between the two sheets of paper.

We then lay the two glasses upon a plate with a rim, so as to preserve the back of the positive paper from the action of light.

Indeed, although the positive paper has only received the photogenic salts upon one surface, its back is none the less sensitive to the action of light, since the salts

have thoroughly penetrated the paper. Light striking the back of the positive paper would consequently produce coloration, and if its action is prolonged some time, this coloration would reach the surface upon which the image is formed, and this would seriously effect, and even spoil it.

All these precautions being taken, the exposition may be made without distinction, in the sun or in the shade; inside or outside of apartments. It is no more than a question of time, the operation being accomplished more or less quick, according to the intensity of light which strikes the negative image. So with the inclination of the holder; it is without influence upon the result, if the pressure has been well maintained.

It is impossible to determine beforehand the time that the exposition should last, to secure the success of the proof. The nature of the paper, its thickness, warmth, and intensity of light, are so many influences that concur in its production, and which it is impossible to appreciate beforehand.

Experience alone can teach the operator how to proceed; we can, however, point out to him some characteristics which will serve as a means by which he can notice the progress of light, and particularly the limit of exposition necessary for every proof, without being obliged to turn our attention to atmospheric changes taking place in the course of this exposition.

In the holder to produce the reversion which we have described, a small door is made in the bottom; and we may by opening it ascertain from the development of the design at the back of the proof, whether the light has produced all its effects.

Yet this method cannot be received as an application which is very binding, because the positive image would not appear at the back of a thick proof as visible as when the paper is quite fine; still it may happen that the design is sufficienly developed before it has passed through the thickness of the paper.

A more simple method, which is applicable in all circumstances, and for all kinds of proofs, consists in leaving a fillet of paper uncovered on one side of the positive proof. In this manner, we observe the action of light by the succession of colors which the fillet of paper acquires.

Thus the fillet of paper passes from white to rose color; then to lilac, to violet, to the ground shade, to black, to green, and finally to deep green. This shade departing, the tint, viewed at a certain angle, acquires a metallic bronzed appearance, and from this moment the intensity diminishes: thus the old bronze passes to green bronze; this to olive bronze, gradually becoming less intense.*

A similar phenomenon takes place with the negative proof on glass covered with albumen, the light not only serving to effect a greater metallic reduction, but by being furnished in the bath with the metallic substance itself which facilitates the reduction. If we add aceto-nitrate of silver to the gallic acid bath, the bath is rendered turbid, and the albumenized surface of the bath is covered with a white powder that strongly adheres to all the colored parts of the proof. If we place behind this glass something dark, the proof appears positive, although viewed by holding it before a light, it is negative. These proofs, notwithstanding their negitive appearance, impart positive proofs quite as good as when they have been treated otherwise.

We have not spoken of these effects in the chapter on negative proofs, since they possess no interest to us, in connection with photographic productions; we point them out only as worthy of study in our researches for new results. Upon this occasion, we will mention also another phenomenon: it is that which results from the exposition to full light, not only of the impressionable face, but the back of the paper which is perfectly white.

We not only see the design produced on both sides under the action of light, but in

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* The salts of silver before being fixed—that is to say in the course of the reductions produced by light—present this peculiarity,—the first effects of light blacken them, and the black passes to white under the continued action of light. When the negative proof is perfectly well developed, and still in the gallic acid bath, if we remove it from artificial light for the purpose of exposing it to the broad light of day, the white parts of the paper which are those not struck by light at the time of exposition in the camera will be blackened, at the same time those which were previously black are whitened. This primitive result is found therefore reversed, and the negative design then becomes positive.

a reversed order of coloration, and the white is represented black, thus making the proof positive at the back of the paper and negative at the face. It results, that this image is wanting in the delicacy and general qualities which a design claims to be acceptable. It consequently affords an interest in relation to science, which we will hereafter refer to, with all the developments which such a serious subject claims.

It is therefore necessary to determine by a previous experiment the comparative coloration which exists between the fillet of paper left bare and the sheet which is covered by the negative proof; this being once ascertained, we shall always determine, after that, the shade of the proof by the uncovered fillet.

We see that the coloring of every negative proof singularly modifies the time of exposition ; there are proofs upon glass as well as upon paper, which attain almost a quarter or demi-shade near the coloring of the exterior fillet of paper, while others do not arrive at the violet shade, until the fillet attains the olive bronze shade.

The exposition of the positive proof must never be pushed so as to give a bronze tint to the shades, for this tint is lighter than that which precedes it.

When we operate upon negatives too much colored, it is almost impossible to obtain good positive proofs ; because the shade of the positive have time to acquire the bronzed tint, before the light has passed through the black parts of the negative, so as to be revealed upon the positive paper.

When negative proofs are very weak and of a uniform tone, the positive proofs are also defective ; for, the light parts of the design are invariably too much colored, if we prolong the exposition enough to obtain great vigor in the shades

With these two kinds of proofs therefore, it is necessary to avoid the details in light for the former, and powerful shades in the latter.

Unfortunately, those proofs which are obnoxious by a defect of harmony in the light are the most common.

In a particular chapter, where we shall treat of resources by the aid of which we can induce the best results, we will give the means for securing very good results with these proofs.

The best negative proofs are those which admit of the exposition being extended until the powerful shades of the positive attain the tint which precedes the bronze appearance, while the more vivid lights of the image (those produced by the direct rays of the sun alone) maintains the whiteness of the paper.

The exposition of every positive proof must consequently be pushed to its extreme limit, and no further, if we wish to have an image perfectly complete.

Indeed, a correct negative proof comprises all the luminous gradations of the picture which it reproduces. These gradations are not always visible to the eye in the design of the proof; but they nevertheless exist in the body of the paper. When a positive succeeds, it presents the details which the appearance of the negative would never have led us to suspect, since light by encountering these invisible reductions exteriorly, suffers an obstacle in which the design produced is justly the measure.

To be continued.

EXTRACTS FROM LA LUMIERE.

Translated by Dr. C. Doratt.

REMARKS ON CERTAIN PHOTOGENIC AND ACCELLERATING SUBSTANCES.

FROM the earliest period of chemical manipulation, the unstability of the compounds and the salts of silver, has been the subject of much observation. This property, most apparent in the insoluble precipitates, by a change of color, was soon attributed to the action of light, no such change being observed to take place during its absence. This alteration in color by the action of light, was more conspicuous in the white precipitates, than in those which became colored by their own action at the moment of their formation. Among these precipitates, one in particular was often observed, from its absolute insolubility, and the presence, inevitable, at that period in all re-agents, of the mineral substance to which it owed its origin. This body was chlorine ; impregnating all the solutions, in the form of spirit of salt, muriatic acid, or hydrochloric acid, by all of which names it has been successively designated.

It was first obtained as an isolated substance by Scheele, in 1774, but its combination with silver had been long known under the appellation of luna cornea or horn silver, from its resemblance to horn that had been acted on by fire, and for many years the chloride of silver was cited as an example of the unstability of the salts of silver under the action of light.

In 1812, Coustois discovered Iodine, another simple body analogous to chlorine in its combinations. The iodide of silver is of a pale yellow color when recently precipitated and moist, becomes darker by light, but much slower than the chlorine of silver. In a dry state, however, it is unalterable.

Bromine, another simple body, was discovered in 1826, by Balard. Bromide of silver—white, like the chloride, darkening quicker than the latter under the action of light,—was supposed to be a substance still more unstable than the two preceeding ones.

There is also another elementary body, Fluorine which has not as yet been isolated, forming with silver, salts, rapidly altered by light. Its properties have not been sufficiently studied.

Chlorine, iodine, and bromine are prepared by the re-action of sulphuric acid diluted with its weight of water, on a mixture of peroxide of manganese, and chloride, iodide or bromide of sodium, aiding the re-action by gentle heat.

CHLORINE GAS.

Chlorine gas is easily produced, by submitting to a gentle heat a mixture of sea salt, powdered manganese, and sulphuric acid diluted as above, or simply by making a paste of the same oxide of manganese with concentrated chlorohydric acid. The formation of the gas is manifested by its yellowish green tint, as seen through the glass receiver, and by its pungent odor. In the Daguerreotype process it is always combined with water, iodine or bromine.

Chlorinated water may be successfully used in the absence of bromine.

CHLORIDE OF IODINE.

Chlorine combines easily with iodine and is prepared by passing a current of the gas, into a receiver containing crystals of sublimed iodine. It unites with iodine in all proportions forming successively a black, a red, and a yellow liquid. The first, containing less chlorine, will not combine with water without depositing its iodine. The red preparation acts nearly in a similar way, with the exception, that the remaining liquid becomes an accellerator, to be used either without a previous coating of iodine on the plate, or with an exceeding faint one. This red chloride, by the addition of more chlorine produces a yellow liquid, little known, soluble in water in all proportions, and is also a good accellerator with heavier coatings.

This yellow chloride is best produced by

adding to the mixture of manganese and chlorohydric acid a few crystals of pure iodine, and applying gentle heat, the yellow liquid distils over into the receiver.

CHLORIDE OF BROMINE.

Chlorine unites with bromine, but the compound is destroyed when mixed with water. The chlorine must, therefore, be dried before coming in contact with the bromine. In this state the bromine will absorb a large proportion, and the result is a volatile liquid analogous to bromine itself. It can only be used in the state of vapor, or combined with anhydrous alcohol or ether.

BROMIDE OF IODINE.

The preparation of bromide of iodine is very simple. It is only requisite to pour some bromine into a vial of water, in which are some crystals of iodine, allowing the action to continue twenty-four hours. A bromide of iodine is formed soluble, on agitation, in the water. Should an excess of iodine exist, it may either be removed by decantation or by a fresh addition of bromine. The exact combining proportions have not been determined. It is, however, probable, that combination takes place atom for atom, or 5 parts of bromine and 8 of iodine.

CHLORO-BROMIDE OF IODINE.

A very stable preparation of these three substances is formed by adding, drop by drop, red chloride of iodine to a saturated solution of bromine in water, until the liquid after reposing for some time emits no more fumes of bromine. If preserved in tight bottles, it will maintain its properties for several years.

BICHLORIDE OF BROMINE OF MONS. DUBOIS.

A new accellerator, under the above denomination has lately made its appearance among the artists of the capital, and highly spoken of. A vial containing 120 grammes placed in a half sized box, will last over a year, at the expiration of which time, ten or twelve drops of pure bromine added to the compound will restore its accellerating property. M. A. GAUDIN.

PARIS, Oct. 1852.

PHOZOMETER APPLIED TO PHOTOGRAPHY.

An achromatic lens, consists of a series of two, three, or four glasses. The focal length of a series is an abstract quantity not reckoned from either of the surfaces composing the series; but a single glass may be imagined, without thickness, which, exposed to the reflection of objects at an infinite distance, shall produce an image of these objects of the same size and with the same clearness as the given series of glasses. The focal distance of this theoretical glass, which opticians denominate "the equivalent," is evidently, as regards the series of glasses, that reciprocal expression of its optical force commonly called "focus" or focal distance. The Phozometer is an instrument to calculate practically the focal length of the theoretical glass.

The instrument consists of a small achromatic collimator, across the focus of which are strained two very fine threads. Its action is grounded on the proportional reciprocity of the size of images in two sets of lenses directed against each other. If, therefore, the interval between the threads of the collimator is a known fraction (say 1-5) of its focal length, this collimator placed in front of the given lens, will give in the focus of the latter the image of the said threads, divided into 1-5 of the required focal length: it will therefore only be necessary to measure this distance on a scale, and multiplying it by five, it will give the required focus. By the same means, and using an eye-piece and a micrometer with movable threads, or better, a parallel micrometer, the focal length of large lenses for astronomical instruments may be measured with great exactness.

In the application of the Phozometer to Photography, it is requisite, that besides the focal length, or focus of vision, it should also determine the photogenic or chemical focus, in other words a capability of measuring the difference of distance in both kinds of foci.

The focal plane of the Phozometer, as described, is normal at the optical axis; make this plane movable around a rotary axis, normal at the optical axis, add a small graduated circle showing the angle of obliquity, and strain over the focal plane, not two, but five or seven threads, or even a greater number. With these additions,

the Phozometer will determine exactly, after a few experiments, and a little calculation, the required distances; the numbers will be given by each phozometrical trial, the only variation will be in the obliquity of the focal plane shown on the graduated circle. T. Porro.

THE NATURAL PHILOSOPHY OF ART.

THE popular notion of works of art is that they are wholly the result of genius or taste, and altogether independent of, and superior to, those natural laws and theoretical rules which regulate the more ordinary productions of human skill and intellect. Even among artists themselves, the degree to which their works are amenable to determinate principles and demonstrative rules, is a matter of doubt and controversy. This uncertainty arises in part perhaps, from an imperfect appreciation of the inherent nature of genius and taste, as well as of the influence of carefully deduced precepts and correct theory upon their development; and probably, in part, from the experienced inefficiency or impracticability of the theories and rules commonly propounded on the subject of art.

The object proposed in the present series of papers is to remove this uncertainty, in some degree at least, so far as it may be due to the latter of the causes above named, by explaining the laws of those phenomena in nature which have an immediate connexion with art, especially painting, and with which the artist must be acquainted in order to produce a truthful representation of nature.

A moment's consideration of the objects and means of art will show how much it resembles the more strictly experimental sciences in its relation to both nature and the human mind.

The aim of all the fine arts is to excite pleasurable emotions; and the means of doing this is such an imitation of those more or less obvious qualities in nature,—the archetype of art,—as may at once be recognized as her image. To pursue this aim successfully, it is manifest that the artist must be acquainted with everything that may properly be included in the general term of *means* to his end. Since, then, pleasurable emotion constitutes this end, and is itself dependent on two antecedent entities,—external nature and the human mind,—the artist is required to understand both the spring of human emotion and the causes of those appearances by the representation of which he proposes to effect his object.

Without insisting, in this place, on the esthetical part of the question, it is proper to urge, with the utmost emphasis, the great importance of the more technical and practical portions. Some of the greatest masters in the best periods of art owed their eminence to their knowledge of the laws of nature, so far as their pursuits required. Many of them diligently studied these laws, and gave proofs of the efficacy of this course in the excellency of their works. Examples, too, of the employment of the same means of arriving at excellence in art may be found in more recent times.

With all the aids that science can furnish, art is sufficiently ample and sufficiently difficult to tax the most highly-endowed minds and the most indefatigable energies among its votaries.

Perhaps the most difficult, and assuredly the most uncertain department of art, is coloring. In this department, too, the discoveries of science and the deductions of philosophy have done less service than in any other. This result appears to be a consequence of the philosopher's not being sufficiently acquainted with the requirements of art, to present his labors in a

form capable of being made available in practice by any but those accustomed to scientific pursuits. The philosopher was contented to explain the origin of colors, whilst that which the artist stood most in need of, at least at the first, was rules for applying these colors; in short he wanted a theory of coloring rather than a theory of colors.

There is a broad and obvious distinction between these two things. The former is an account of the cause of the colors of natural bodies, as depending on the texture of surface, or composition of media; the latter is a system of rules for arranging these colors in such a manner as to be productive of an agreeable effect.

For the purposes of art, colors may be considered under two classes, absolute and relative. The absolute colors are those which bodies possess when seen separately and uninfluenced by any other. The relative are those *apparent* colors which are *produced to the perception*, by the modifying power each has over the other when placed together. Both of these classes of colors are strictly subservient to fixed laws which are capable of distinct enunciation.

The laws of the absolute colors have been known since the time of Newton, by whom they were discovered and explained.

It is to Sir David Brewster, however, that we are chiefly indebted for our acquaintance with the true nature of relative colors. Before this time the composition of the solar spectrum does not seem to have been accurately known. A true theory of the complementary colors was, consequently, until then impossible.

Although an acquaintance with the laws of absolute colors is interesting, and highly useful to the artist, it is the system of relative colors which chiefly concerns him, and a knowledge of which is of the utmost importance to him.

The common phenomena of this class of colors have been often stated; such as that, after looking intently for some time on a red wafer placed on white paper, we shall, on removing the wafer, perceive a green image of it in the place it occupied; and that a blue object would, in the same manner, give rise to an orange image. The power of the complementary colors in juxtaposition to enhance each other's intensity is also well known. Traditionary maxims, such as "warm lights have cool shadows, and cool lights warm shadows," are also current amongst artists. The causes of these phenomena, and the grounds of these maxims, seem to be very imperfectly understood; and in no work, professedly for the use of artists, is there, so far as we remember, any accurate explanation of them to be found.

These instances of the mutually modifying power of colors may be given as examples of the simplest forms of a wide range of effects which have the closest connexion with Art, and the knowledge of which is, consequently, indispensible to every artist.

A correct explanation of the effects may indeed, be considered as the true theory of the harmony of colors, and when it is remembered how much color is capable of enhancing the value of every other quality of art, the importance of such a theory is too obvious to require enforcing by argument.

The subject of color in relation to Art has engaged the attention of several eminent scientific men. The principle of these are Harris, Mérimée, and Chevreul. The theory of the first named, an Englishman, has been well spoken of and disseminated in our Royal Academy by more than one of its professors of painting; to us, it seems not only defective but positively erroneous. "It appears from numberless observations," says Mr. Harris, as quoted by the late Mr. Phillips, "that the human eye is so constituted with respect to color, that it derives pleasure from viewing each of the primary colors alone; yet if two of these are introduced to its view together, it requires, for its entire gratification, the presence of the third also; and that want causes a physical sensation in the eye itself, which, without mental agency, and in a manner unknown to us, produces the third color."

This author, it will be seen, ascribes the production of the complementary colors to the "pleasure" the eye "derives from viewing each of the primary colors alone," and the "want" in the eye for some "third color." Passing the questionable philosophy which attributes an emotion of "pleasure," or even of simple sensation, to the eye, we hope to show the manner of producing the "third," that is, the com-

plementary color, *is* known ; and that no "color is produced by the eye during the presence of another."

It is difficult to discover the exact nature of Mérimée's theory. He accepts the Newtonian scheme of the solar spectrum, and apparently ascribes much importance to the circular arrangement of the chromatic scale, overlooking the fact of its being wholly an artificial arrangement, and having nothing in nature to afford it countenance.

The objection we make to this theory, and several others of more recent date, is, that they assume the "circular arrangement" to be an *ultimate* fact, and then appeal to this assumption for confirmation of their doctrine of the harmony of coloring.

The true theory of harmony in coloring does not depend for its value on any formal arrangement of the chromatic scale, circular or otherwise.

The system of M. Chevreul is the most recent. Its peculiarity consists chiefly in the laws of successive, simultaneous, and mixed contrasts, on which its author conceives the phenomena of color to be based. The advocates and expounders of this system in England, assert that these contrasts form the foundation of the practical laws of coloring, and claim the honor of their discovery on behalf of M. Chevreul. By successive contrasts M. Chevreul means the well-known facts, that, if we look steadfastly for a few minutes on a red surface, fixed on a white sheet of paper, and then carry the eye to another white sheet, we shall perceive on it a green image of the red surface ; in the same way green surfaces would cause red images of them ; blue objects will, under the same circumstances, give rise to orange images, and yellow objects to purple images.

The "simultaneous contrast" of this author consists in the fact, that two colored surfaces, in juxtaposition, mutually influence each other, the complementary colors increasing each other's intensity, and the non-complementaries diminishing it.

Now as the very idea of contrast implies the perception and comparison of at least two things, and such perceptions being *necessarily successive acts*, we conceive the expression "simultaneous contrast" to be a contradiction in terms, and that consequently the alleged fact is an impossibility.

M. Chevreul's "mixed contrast" professes to explain the reason why a brilliant color should never be looked at for any length of time if its full brilliancy is wished to be appreciated : for example, if a person look for a short time, at any of the primary colors, the complementary color is generated in the eye, which, adding itself to the primary, degrades its purity. Assuming the term "mixed" to mean a combination of the "successive" and "simultaneous" contrasts, and, admitting, for the sake of argument, the *possibility* of the coexistence of the successive and the simultaneous, or, in other words, of the present and the future, we question the correctness of the explanation. The fact appears to us to depend upon a physiological law of vision, which we will explain hereafter. We have given this cursory notice of the principal previous theories for the purpose of justifying, in some measure, our present attempt to explain the phenomena of color, and the principles of the harmony of coloring, which otherwise might seem superfluous.

In the following essays we shall first explain the origin of colors, both in what we have classed as their absolute and relative condition, and thence endeavor to deduce practical rules for the harmonious arrangement of them, in uniformity with what must be the standard of truth, a healthy perception, rather than as referred to any conventional arrangement of chromatic scales. We shall next attempt to show how these principles regulate shadows and reflected lights, and the various relations of chiaroscuro and tone ; and lastly, we will explain some of the phenomena of undecomposed light, so far as they may bear upon the pictorial representation of nature.

John Sweetlove.

CONSTITUTION AND BY-LAWS

OF THE

AMERICAN PHOTOGRAPHIC INSTITUTE.

PREAMBLE.

WE, the undersigned, for the purpose of attaining a higher degree of excellence and artistic skill in Photographic Science; of promoting a more genial union among its votaries; and of acquiring all improvements and advantages connected with the art, do hereby ordain the following Consitution and By-Laws.

CONSTITUTION.

ARTICLE I.

This institution shall be called and known by the name of the "American Photographic Institute," devoted exclusively to the advancement of Photographic Science and Art, and shall be located, and transact its business in the city of New York.

ARTICLE II.

OF MEMBERSHIP.

The name of a person offered for initiation must be proposed by a member, in writing, which must be entered on the record, and the subject referred to a committee of three for investigation, who shall report at the succeeding meeting, when the candidate may be balloted for, with ball ballots; and if not more than two black balls appear against him, he shall be elected, but if three or more appear, he shall be rejected.

ARTICLE III.

OF OFFICERS.

Sec. 1. The Officers of this Institution shall consist of a President, a Vice President, a Recording Secretary, a Corresponding Secretary, a Treasurer, a Librarian and Sergeant at-Arms.

Sec. 2. The duties of the various officers shall be laid down in the charges of their office, and as specified by these Articles and these By-laws of this Institution.

Sec. 3. Nominations for the election of officers shall be made only on the two meetings immediately preceding the elections, except when the nominees for the office all decline.

Sec. 4. Officers shall be elected at the last regular meeting in each term, and shall be installed at the first meeting in the preceding one.

Sec. 5. Any officer absenting himself for more than three successive meetings, his seat shall be declared vacant, unless prevented by sickness, or absence from the city, in which case a notice to that effect must be forwarded to the Institute; and all vacancies shall be filled in manner of the former selection to serve the residue of the term.

ARTICLE IV.

TERMS.

Regular Semi-Annular Terms shall commence on the first regular meeting of March and September; and all terms shall end on the day on which the succeeding ones commence.

BY-LAWS.

ARTICLE I.

TIMES OF MEETING.

OF REGULAR AND SPECIAL MEETINGS.

§ 1. The members of this Institution shall assemble on Friday evening of each week, for the transaction of business, scientific experiments and discussion of subjects calculated to promote the avowed objects of the Institution.

§ 2. Special meetings may be called by the President at the request of three members in writing.

§ 3. The hour of meeting shall be, from the 1st. day of October, to the 1st day of

March, at 7 o'clock, and from 1st. day of March to 1st. day of October at 8 o'clock.

§ 4. *Quorum.* At all regular or special meetings, seven members shall constitute a quorum for the transaction of business.

ARTICLE II.

OF MEMBERSHIP.

§ 1. No person shall be admitted into the society unless he be, or has been, a practical operator, and of good moral standing.

§ 2. Any member intending to propose a candidate for membership, shall first ascertain if he be qualified according to the preceding section. His name shall then be submitted in writing, and at the time of making the proposition, $1 00 shall be deposited with the Secretary. If the candidate be elected, he shall be immediately notified thereof by the Secretary. Should he not present himself for initiation (if a resident of New York or Brooklyn) within four weeks after his election, (unless prevented by sickness or absence from the city) the election shall be void and the amount deposited forfeited to the Institute; should he be rejected the deposit money shall be refunded.

§ 3. *Investigating Committee.* On proposition of a candidate, a committee of three shall be appointed by the President to investigate the elegibility of said candidate for membership. They shall visit him personally, or communicate with him in writing, and shall report the result of their investigation in writing, at the next regular meeting of the Institute.

§ 4. *Members to sign the Constitution.* Every member on being admitted shall sign the Constitution and By-laws of this Institution, and thereby agree to support the same, and pay all legal demands against him, as long as he remains a member.

§ 5. *When Admitted.* Candidates may be initiated on the same evening of their election

ARTICLE III.

TERMS OF ADMISSION.

All persons initiated into this institution, shall pay into the treasury the sum of $5.

ARTICLE IV.

OFFICERS, AND HOW ELECTED.

§ 1. The elective officers of this Institute shall consist of those enumerated in Sec. 1, of Article 3, of the Constitution. Said officers shall be voted for separately by ballot, and must receive a majority of all the votes given, to entitle them to election; and when three or more candidates are in nomination, the one having the least number of votes shall be withdrawn at each ballot.

§ 2. The nomination of officers shall be made according to Sec. 3, Art. 3, of the Constitution, and no nomination shall be received unless the nominee consent thereto.

§ 3. *Tellers.* At the time of holding any election for officers, the President shall appoint *two* tellers. They shall receive the ballot of each member entitled to vote, and shall canvass the votes given, declare the result to the President, by whom it shall be announced to the Institute.

§ 4. *Time of Election* Upon the evening designated for the election, such election shall take place, and be in order immediately before the meeting is open in "New Business."

§ 5. Vacancies occurring shall be filled in accordance with Sec. 5, Art. 3, of the Constitution.

ARTICLE V.

DUTY OF OFFICERS.

§ 1. It shall be the duty of the President to preside at the meetings of the Institute, (or in his absence the Vice President) and enforce strict observance of the Constitution and By-laws. He shall appoint all committees, unless otherwise ordered by a vote of the Institute. He shall decide all questions of Order, give the casting vote only, and deliver the charge of his office.

§ 2. In the absence of both President and Vice President, a President *pro-tem* shall be appointed.

ARTICLE VI.

THE RECORDING SECRETARY.

The Recording Secretary shall keep just and true account between the Institute and its members, collect all dues and assessments, and report to the Institute any member neglecting to pay the same, when duly notified. He shall credit the amount as paid, and pay the same over to the Treasurer immediately, receiving his re-

ceipt for the amount, in a book for that purpose. He shall also keep a correct record of the minutes of the Institution; and prior to election for officers prepare a roll of the members who are, by the laws of the Institute, entitled to vote, and have the same in the Institution on the night of election. It shall be his duty to notify every member who is three months in arrears, of the amount due by him to the Treasury. It shall be his duty to introduce formally to the society every member immediately after his initiation.

ARTICLE VII.

THE CORRESPONDING SECRETARY.

It shall be his duty to receive and lay before the society all foreign and domestic correspondence connected with the scientific department of the Institute. He shall translate or have translated, if so desired, for the benefit of the members, extracts from foreign works on improvement and discovery in the art. He shall keep a true and correct record, in books for the purpose of all chemical and photographic receipts; which records shall at all times be ready for the inspection of members. He shall also keep a correct record of the scientific minutes of the society. He shall notify the members present of the subjects for experiment or discussion at the subsequent meeting. He shall also notify non-resident members, of all discoveries and improvements obtained by the Institute.

ARTICLE VIII.

THE TREASURER.

§ 1. Before his initiation into office, shall give *two* sureties, to be approved by the Institute, subject to such alterations as may be prescribed by the society. He shall receive all moneys, and hold the same, until the expiration of the term, unless otherwise directed by a vote of the institution.

§ 2. He shall pay all bills of the association, if approved at a regular meeting, and signed by the President. He shall keep full and accurate account of all monies received and expended, and lay before the society, quarterly, statements of its funds.

ARTICLE IX.

THE LIBRARIAN.

Shall have the charge of all books, manuscripts, models and apparatus belonging to the Institute. He shall keep a correct account of the same, and have them ready for inspection and service at every regular meeting. He shall also have charge of the rooms and regalia, and see that they are prepared for the meetings.

ARTICLE X.

JUNIOR PAST PRESIDENT.

It shall be the duty of the J. P. P. to deliver the charge of his office, in installing newly elected officers, and perform all other duties appertaining to his office.

ARTICLE XI.

SERGEANT AT ARMS, AND WARDEN.

The Sergeant at Arms shall have charge of the door, and admit none but members into the meetings of the Institute.

ARTICLE XII.

INITIATION OF MEMBERS AT A DISTANCE.

Any person residing out of the city of New York, wishing to become a member of the Institute, but so situated that he cannot attend the meetings of the association, may be elected and admitted to full membership after having, in writing, answered all questions addressed to him by the President, and duly signed the obligations imposed on candidates prior to their initiation into membership of the Institute.

ARTICLE XIII.

HONORARY MEMBERS.

Literary or Scientific persons may be elected honorary members of the Institute, if proposed by a member; and shall have the privilege of attending all meetings of the society, but shall have no vote at any election of officers, nor take part in the business of the Institute. In all other respects, as candidates they shall take upon themselves the obligations imposed on all members of the association.

ARTICLE XIV.

DUES AND FUNDS.

§ 1. There shall be but one Fund in this Institution, called the General Fund, which shall consist of all moneys belonging to the Institute.

§ 2. Every member of the institute shall contribute to the general fund, the sum of 50 cents per month.

ARTICLE XV.

PENALTIES.

Any member who is more than three months in arrears, shall be suspended, until such arrears be paid; and if six months in arrears, he may be expelled by a vote of the society.

ARTICLE XVI.

AMENDMENTS.

No part of this Constitution and By-Laws shall be repealed, altered, annulled or amended, unless a proposal in writing, signed by at least three members, and presented to the Institute at least two meetings previous to the discussion, when, if two-thirds of the members present, vote in favor of the motion, it shall be adopted.

ARTICLE XVII.

ORDER OF BUSINESS.

1. The President at the appointed time shall take the Chair, and call the meeting to order.
2. Roll call.
3. Reading minutes of previous meeting.
4. Report of Investigating Committee.
5. Election of Candidates for membership.
6. Initiation of Candidates.
7. Liquidation of Accounts.
8. Report of Committees.
9. Unfinished Business.
10. Discoveries, Improvements, and Scientific Communications.
11. Scientific Experiments, Lectures and Debates.
12. Notice of subjects for the next meeting.
13. Election of Officers—New Business.

RULES OF ORDER AND DEBATE.

1. No motion shall be debated, until it has been seconded and stated by the chair, and if desired by any member, such motion shall be reduced to writing.

2. After a motion shall have been stated by the chair, or read by the Secretary, it shall be deemed in possession of the meeting, but may be withdrawn at any time before a decision or amendment

3. When a question shall be under debate, no motion shall be received, unless to amend, substitute another, refer it, postpone it, to lie it on the table, previous question, or to adjourn, which latter shall always be in order.

4. In case of more than one amendment to any question, the last offered shall be decided first.

5. Every member wishing to speak on a question, shall rise and address the chair.

6 When two members rise at once, the chair shall decide which is entitled to the floor.

7. When a member is called to order by the chair, or by a member, he shall sit down and await the decision of the chair, which decision shall be without debate, subject to an appeal to the meeting.

8. Any member feeling aggrieved by any decision of the chair, may appeal to the meeting, which appeal, if seconded, shall be put and decided without debate.

9. The Ayes and Nays on any question may be called for by a member; and if one-third agree thereunto, the Secretary shall call the names of each member, who shall answer "*Yes*," or "*No*," unless by special reasons he be excused by those present; and when the result of the call shall be announced, no member shall be allowed to alter his vote, nor shall any member, under *any* circumstances have his name recorded on the question, who was not present when the call was made.

10. An appeal may be had from any decision of the chair, made at any meeting for business, if demanded, the same evening the decision is made, by five members present at such meeting.

RULES OF ORDER AND SCIENTIFIC EXPERIMENTS.

1. During a Scientific Lecture or Experiment, no member shall question or interrupt the person lecturing or experimenting. All questions shall be deferred until the close of the subject.

2. All subjects for experiment shall be acted on, in the order in which they have been announced by the Secretary on the previous meeting, unless by a unanimous vote of the members present.

3. Any member wishing to show an improvement in manipulation, during an experiment, shall rise from his seat, and, at the request of the President, shall state or point out the improvement, in as few terms as possible, or at the request of the person

experimenting shall supply his place at the table.

4. The explanation of all models shall be first in order. The explanation shall be made by the Inventor, or at his request by the Secretary, or other member.

5. At the request of at least five members, any former experiments may be repeated. The members applying for such repetition stating their objects for the same.

6. All chemical compounds prepared in the Institute, may be given to members on their paying the value of the materials used in forming such chemicals.

7. No models, apparatus, chemicals or other articles belonging to the Institute, can be removed or carried away, unless by virtue of a permit from the President, signed by the Treasurer and Secretaries. And all books, models and apparatus so borrowed, must be returned to the Institute on the evening of the next regular meeting. Also any such articles being lost or injured by any member having loaned them, shall either be replaced by new ones, or the value thereof paid to the Recording Secretary, according to a valuation imposed by a committee of five.

8. It shall be at the discretion of the Librarian and Corresponding Secretary to purchase any articles needed at the experiments, the amount of such expenditure not to exceed $2 00. The account thereof being handed to the Treasurer or Secretary at the next regular meeting.

PHOTOGRAPHIC MANIPULATION.*

Part II.

CONTAINING THE THEORY AND PLAIN INSTRUCTIONS IN THE ART OF PHOTOGRAPHY, OR THE PRODUCTION OF PICTURES THROUGH THE AGENCY OF LIGHT.

BY ROBERT J. BINGHAM,
Late Chemical Assistant in the Laboratory of the London Institution.

WITH ALTERATIONS BY THE EDITOR.

DAGUERREOTYPE.

IN the first part of *Photogenic Manipulation*, we have described a variety of processes by which impressions can be obtained upon paper, glass, &c. by the action of light. This second portion of our Manual, it is our intention to devote entirely to the method of producing pictures upon silver plates, a beautiful art, well known throughout Europe as the "Daguerreotype." (1.) (7.) Part 1.

2. This art has been patented in England, although the discoverers, Daguerre and Niepce, had a handsome pension allotted to them on condition that the process should be given "freely to the whole world."

3. The manipulation requisite to obtain a perfect picture by this process appears at first to offer more difficulties to a beginner than most of the other photographic processes; but, in reality, this is not the case, for with care and attention to the details subsequently given, very little difficulty will be found.

4. The entire process may be divided into six distinct operations:—

1st. Cleaning and polishing the silver surface of the plate.

2nd. Applying the iodine and other sensitive coatings.

* Continued from vol. 3, No. 1, p. 60.

3rd. Obtaining the impression on the plate by the means of a camera.
4th. Rendering the impression so obtained visible by the aid of mercury.
5th. Removing the sensitive coating of iodine and bromine.
6th. Fixing the picture by means of a coating of gold, and drying the plate.

5. These processes we shall now proceed to describe at length, after devoting a little space to some remarks on the choice of the plates. Of these, several varieties are sold; those of English manufacture are perhaps the best adapted for a beginner, being stouter than the French or German, and the surface of silver being thicker, they will allow of being more frequently cleaned.

6. The silver, however, on the English plate, is not so pure as on the French. The former generally contains a quantity of lead, which is, to a certain extent, detrimental. The French plates should not be inferior to those marked 1.40, and there are some marked 1.20 that are still better, and, though more expensive, they are perhaps in the end less costly. No one should use plates less than 1.40 without being sure of obtaining a satisfactory daguerreotype the first trial, for they will scarcely admit of being repolished, especially if the picture has been fixed with the hyposulphite of gold. Good plates should have no specks or scratches on the surface, and if any trace of copper be observed on the silver surface, the plate should be rejected.

7. We shall now proceed to describe the first process, viz., cleaning and polishing the silvered surface of the plate. For this innumerable plans have been proposed; almost every operator, after a time, adopting some method of his own. At many of the daguerreotype establishments, the plates are cleaned in a lathe.*

8. Some have recommended—that the cotton-velvet on this buff should be previously soaked in a strong solution of soda, in order more effectually to get rid of any greasy matter. It should then be nailed on the circular board, without any part of its surface being touched by the fingers. Ammonia has been recommended instead of soda, but the latter is decidedly the better of the two; for, if there be any grease in the velvet, the ammonia will form a soap with it, more injurious to the plate than the grease itself. Our plan is, to nail on and use the velvet in the state it is sold, and by using plenty of charcoal and rouge, after polishing a few plates, the velvet becomes quite clean.

A method of holding the plate against the revolving buff is now required; for this purpose the plate-holder Figs. 12 and 18, is used.‡ It consists of a squarep late of iron, rather larger than the silver plate, round which is fixed a flat rim, forming a space the size of the latter. This rim is not quite so thick as the plate, the silvered surface of which must be above it. A brass boss is placed at the back of the holder, having a cup-shaped hole in its centre, into which a steel spindle fits loosely. Two of these holders are required for each sized plate, one to be used with No. 1, or oil buff; the other, which must be kept perfectly clean, and free from grease, for the finishing buff. The plate being placed in the holder, the latter is held firmly against the buff No. 1 by the spindle, which is also placed against the rest of the lathe. Motion is now given to the buff, and after a few revolutions the plate should be examined. A fixed impression will sometimes require much cleaning, particularly if gilded deeply, whilst, with a proof not fixed, a few turns will be enough. It may perhaps be difficult to conceive, without seetng the apparatus at work, how the plate can be cleaned with a revolving plate-holder, the buff also revolving; but the reader must recollect that the plate-holder is not held in the centre of the buff, or in other words, the centre of the plate-holder and the centre of the lathe do not coincide—for, if so, the plate would obviously not be cleaned—but if the two centres are a very little removed from each other, then the plate and buff revolve in opposite directions, and thus the plate is very perfectly and evenly cleaned and polished, for every instant the buff cuts the plate in a different direction.

9. We will now suppose the operator

* See Phot. Art Journal Vol. 1 pages 59 and 179, for description of lathes.

‡ As we shall give shortly an illustrated description of the most approved American apparatus, we think it unnecessary to give the engravings accompanying this work entire, as the styles described are out of date with us.—*Ed. P. A.-J.*

has laid bare an even surface of silver : the next step is to get rid of all the oil. The plate should then be laid, face downwards, upon a piece of cotton velvet, and rubbed backwards and forwards until an *apparently* clean and pure surface is obtained. This, however, is not the case ; for the surface is still *chemically* greasy. The plate now requires what is technically called burning; that is, decomposing the remaining oil by heat.* For this purpose the operator will require a spirit-lamp and a pair of plyers, and the flame of the spirit lamp applied to the under surface, until white spots or clouds appear on the previously bright surface ; the lamp should then be withdrawn, and the plate suffered to cool. This process requires a little care ; for if the plate be not heated enough, white clouds will form in an after process, viz., whilst gilding. This is an extremely annoying circumstance, as we seldom attempt to gild any except really good pictures.

10. If the plate be heated too much it will be almost impossible afterwards to obtain that fine black polish which is so essential to a good daguerreotype, the shadows will appear full of innumerable minute white spots, giving a gray appearance to the whole picture. Especial care should be taken when manipulating with French plates, as, on account of their being so much thinner, they bear but a slight heat, and, if overdone, are liable to become soft and bend ; the texture of the silver is also altered by too much heat. It is safer, and perhaps a better plan to clean those with spirit alone, and not attempt to use any oil, they will not then require burning ; more time however, will be required in cleaning them. After the plate has been burnt and suffered to cool, it is applied to the finishing buff, all possible precaution being taken to keep it free from grease. When a number of plates are to be done, it is best to oil, buff, and burn them all, before commencing the polishing process on the second buff. Plenty of the prepared charcoal should be used, and the plate applied to the buff until a fine polish is obtained ; the pressure should be moderately strong at first and then gradually lessened ; the plate should be finished by a quick revolution and a very light pressure with the plate holder ; the plate should be taken away from the buff during its revolution, and it will then be quite ready for the next or iodizing process, but in inexperienced hands, this is rather a difficult thing to do, particularly with large plates, for they are apt to fly out of the holder and be damaged by falling. If it can be accomplished, the plate will present a fine black polish, with scarcely any *visible marks of the velvet*, whilst if the lathe is *stopped*, and the plate *then taken* off, it will have a circular *grain* on its surface, indicating the direction of the last revolution of the buff; the plate should either have no visible *grain*, or it should have one in a direction across the narrow part of the plate if intended for a portrait, or, if for a view, the length-way, that is in the same direction as the horizontal lines of the picture.

11. To "*lay the grain*" of the plate, daguerreotypists use a straight buff. It consists of a piece of wood covered with clean cotton velvet, and slightly curved so as to allow for the deviation from the parallel direction which the motion of the hand invariably takes in the operation of buffing ; the plate should be placed in the holder, and lightly buffed in the direction required, having previously dusted a little of the charcoal powder on the buff; the cleaning and polishing process has now been finished, and we may at once proceed to iodize the plate. We have described at some length the method of cleaning and polishing with the lathe, because, by its means, plates may be more quickly prepared than by any other plan ; however, there are other methods quite as effectual although they occupy a little longer time, still they are prefered by some.

Messrs. Paine of Islington, and several clever American operators, have for some time past made use of a slightly different method of giving the last polish to the plate. Their method is to procure a piece of very smooth and soft doeskin, and nail this on the buff instead of the cotton velvet, then well cover it with a quantity of the best rouge, quite dry, and with a clean

* We believe M. Claudet does uot burn the oil out of his plates, but he contents himself with rubbing the plate on a large piece of clean cotton velvet, having no powder of any other sort upon it. This plan appears to do very well for his method of preparing the plates with the weak bromide of iodine, but it does not answer if the bromide of lime be used.

brush (which should be used for this purpose alone) take out all the rouge. This is repeated two or three times, until no more dust can be brushed out; then with the leather thus prepared, the plate is polished evenly all over, and with a very light hand. It is probable the first few plates will be slightly scratched, but after the leather has got black from the silver which has been rubbed into it, a most beautiful polish may be obtained, and, with care, not a single line or mark can be seen on the plate. Should the fingers accidentally touch the surface, or the buff get dirty in any way, if may be cleaned by means of a little rouge and a good brushing. With care, the leather will last for years and get better by use. It will be observed the peculiarity of this process is, that no powder is used to polish the plate with; this is carefully got rid of by the brushing. These buffs should be kept quite dry, and it is better to enclose them in a well closed box immediately after using. I have found it a great advantage to keep a little lime or fused chloride of calcium at the bottom of the box, at a little distance from the *surface* of the buff. If the buffs get at all damp, it it impossible to get fine black pictures, nothing so soon produces a cloudy appearance—a circumstance which many operators are frequently annoyed with.

12. Figs. 2 and 3 represent two forms of plate holders or instruments for supporting the plate while being cleaned and polished. They consist of a flat board, or iron plate a trifle smaller than the plate, so as to allow the edges of the latter to project about one-sixteenth of an inch all round. The plate is secured by two small pieces of plated brass, or by clamps and springs on the sides; one of which is moveable, and fixed by a screw attached to the opposite angle of the board. These springs and clamps are rounded off, so that the buff should not be torn by passing over them. It is provided with a clamp, so that it may be fixed to the table.

13. Perhaps the best form of plate-holder is the one shown at fig. 4 and is much used in America, and particularly adapted for the thin French plates. It consists of an iron clamp, screwing down upon the edge of a block a trifle smaller than the plate to be cleaned. These blocks are made to shift, so that with one clamp and different blocks any sized plate may be cleaned. They can also be reversed, so as to be buffed either way of the plate, or the plate-holder used for the lathe may be used for buffing by the hand. Having fixed the daguerreotype plate in one of the holders described, and previously bent the edges, a little tripoli is sprinkled upon it, and a small piece of finely-carded cotton being folded into a round pellet or knot, is moistened with good olive oil, and the plate rubbed with it by a continuous circular motion until all scratches, mercury, or traces of the last picture disappear; the oil and tripoli are then wiped off with a clean piece of cotton, at the same time wiping the edges and back of the plate with a cloth; and in order to get rid of all appearance of oil, the plate should be rubbed upon a piece of cotton velvet until a fine black polish is obtained: now proceed to burn out the oil as directed (§ 9), and allow it to cool. A little very fine tripoli should then be dusted upon the plate, moistened with a few drops of spirits of wine; with a knot of cotton, rub the plate with a circular motion until the white film which appeared upon heating the plate has been removed, adding more alcohol if necessary; with another pellet of cotton, dry and clean off the tripoli. Water acidulated with nitric acid, may be used (as originally recommended by Daguerre) instead of the alcohol; but we think it is more apt to stain the plate if not well managed. Pure water, or a weak solution of caustic potass, will answer equally well.

14. M. de Northomb asserts that alcohol in which a little caustic potass is dissolved gives the impression a fine tone of color.*

15. The plate having been cleaned, but not polished, ought to present a uniform gray surface, without any stains or scratches; and if breathed upon, the vapor should be condensed in one uniform sheet on it. The disappearance of the film should be attended to; for any stain not at first visible will be indicated towards the end of the evaporation. Assuming that the plate is quite clean, the polishing process may be commenced. For this purpose, the plate may be fixed to one of the plate-hold-

* Lerebour's Traite de Photographie.

ers and briskly polished with the buff, (§11) always observing to give the final polish in a direction across the intended picture (§10), and with a light hand. The pressure at the termination of the buffing should not be more than the weight of the buff. The plate will now be ready for iodizing. Some operators prefer using two buffs, dispensing with the cotton and alcohol, and using the first buff in their place on which they apply charcoal powder, and polish off the white film formed by heating the plate; with the second buff they give the final polish to the plate.

16. Rottenstone will do in the place of tripoli. It may be prepared sufficiently fine in the following way:—Select a piece of rottenstone (not the powder) having a light buff color, reduce the stone to powder in a mortar, and then throw it into a basin of cold water, allow it to stand a few minutes, and pour off the supernatent liquid, which will have in suspension all the finer particles of the rottenstone, the sand and coarser particles remaining at the bottom of the vessel. By allowing the liquid to stand a shorter or longer time, we may obtain the rottenstone of any degree of fineness. In order to get rid of the water, the liquid should be left undisturbed until it has become quite clear; the water should be carefully poured away, and the paste of rottenstone dried on a plate at the fire, or it may be used in this pasty state.

17. In France, the essential oils of bergamotte, citron, turpentine, lavender, or rosemary, have been much used for polishing the plates; and this plan is stated by M. Charles Chevalier, in his last work on the Daguerreotype, to be superior to all others. This we believe to be quite true, provided we could obtain the essential oil quite pure, and free from adulteration with the fixed oils; but this is a difficult matter. It may be easily detected; for the essential oils are very volatile, and are dissipated at a very slight heat. The *fixed oils*, on the contrary, are not volatile; and on applying a strong heat, they decompose into gas, but do not volatilize: therefore, if we drop on a piece of paper suspected essential oil, it will cause a greasy stain; but on the application of heat to the under surface of the paper, the stain will disappear, and the paper appear as clean as before, if the oil is pure; but if there is the smallest quantity of fixed oil, the stain will still remain, notwithstanding the heat One advantage the *pure essential* oils have in cleaning is this—the plate requires no burning.

18. The method recommended is to mix in a bottle some tripoli and oil of lavender; allow a drop of this mixture to fall upon the plate, then with a knot of cotton rub the plate for a little time, clean off the oil with a fresh piece of cotton and dry tripoli, and at once give the final polish with the buff. The following we have found to be a very ready and easy method of polishing, and it has this advantage, a holder for the plate is not required; provide a smooth deal board about two feet long and eighteen inches in width, on this fasten a piece of clean cotton velvet of the same size; this velvet should be marked off into a number of divisions, each about the size of the ordinary buff; a board of the size directed may be divided into six parts, each four inches in width, and eighteen inches in length; each of these, although on the same board, is to be regarded as a distinct buff, and must be kept clean and free from the materials used on its neighbor. When we wish to clean a plate, the first buff on the right hand is to be dusted with some fine tripoli, and then moistened with a little of the best oil of turpentine (this essential oil may be had, under the name of *camphine*, at the oil shops): the plate should be laid with its face on the velvet, and rubbed quickly up and down, care being taken that the pressure exerted by the fingers on the back of the plate be not too much confined to one part. This should be particularly attended to when cleaning a thin French plate; but should any part of the plate be more difficult to clean than the rest, the pressure should be applied to the back just at that part. After a good surface is obtained, the plate should be passed on to buff No. 2, and rubbed until the whole of the turpentine and tripoli has apparently been removed. It may then be passed on to No. 3, on which a mixture of some very dry prepared charcoal and rough has been dusted. On this buff the whole of the grain on the surfaces of the plate left by the tripoli should be removed, and a beautiful black polish left. In order to receive the finishing polish, and to "lay the grain" in the proper direction

(§ 10, 11) it is to be passed on to No. 4, and rubbed briskly and lightly over the surface; on this buff the dry prepared charcoal alone is used. Care should be taken, before buffing a plate, that the buff, the charcoal, and rouge are quite dry, *this is very important*, and particularly so when we make use of rouge as a polishing powder; if the rouge or the buff be at all damp, a red stain will appear in patches over the plate when we attempt to gild it (§ 11).*

19. After the plate has been cleaned and polished by any of the plans we have described, it is ready for the second process, viz., applying the iodine and other sensitive coatings; but previous to submitting it to the action of these substances, any particles of dust left by the polishing process must be removed. This is readily accomplished by passing lightly over the surface of the plate a knot of clean cotton, or a broad camel's hair tool similar to those used by gilders for the application of gold leaf. It is advisable that the last buffing should be given only a short time previous to the iodizing, as it causes the plate to be much sooner iodized. Perhaps this is occasioned by the action raising, in a slight degree, the temperature of the plate. Care should be taken to apply the buff the last time as evenly as possible, or the iodide will be liable to attach itself to one part more than another. In order to remove this difficulty, Mr. Kilburn places his plate on a gas stove for a few seconds, previous to transferring it to his iodine box; by thus raising the temperature of the plate above that of the atmosphere, no moisture can be condensed on its surface. This is undoubtedly a great advantage; but the true reason for the last polish being given to the plate just before its being used we believe to be this:—It is well known, since the publication of Moser's experiments upon the formation of images on metallic and other plates in the dark by "*invisible light*," that all bodies radiate a certain amount of organic matter, according to their degree of cleanness. Now, a daguerreotype plate, when clean, is just in a position to receive and condense this organic matter on its surface, which is injurious to its sensibility, and to the clearness of the resulting proof; this effect takes place in proportion to the *time* in which it has remained opposite a relatively impure surface. For this reason, the plate should be used directly after having been "buffed," or if not used immediately, it should be deposited in a *clean* plate-box. No plate-box should be used for a finished plate that has before been used for an oily or dirty one.

20. *2d Process—Applying the iodine and other sensitive coatings.*—For this purpose, the operator will require an iodine box or pan; a bromine pan; some iodine and bromine, or other accelerating compound.

21. The most simple form of apparatus for applying the coating of iodine or bromine, consists of a porcelain pan, which may either be square or round. The round form, however, has this advantage, although it occupies more space; the frame holding the plate may be turned round during the operation of iodizing without taking it off the pan. By this means, the vapor may often be prevented attacking one part of the plate more than another. The edge is ground flat, and it is provided with a ground glass cover, fitting it air-tight. About three-eighths of an inch below the top, is a ledge on which rests a frame, made either of hard wood varnished, slate, or glass, for the purpose of holding the plate over the iodine or the solution.

22. This apparatus is sometimes made of a square form, and is fitted into a wooden box. This has some advantages. We believe it originated in France, and was there used for the application of the vapor of bromine. It consists of a box, in the interior of which there is a shallow earthenware or glass pan, having a plate glass cover, fitting air-tight. On the top of the box there is a ledge upon which rests the frame, to hold the plate whilst being prepared; one end of the box is hinged, so as to allow the pan to be withdrawn if necessary. This is a very convenient apparatus; and we believe it to be the best, if we adopt the plan of determining the necessary exposure of the plate to the iodine and bromine by the *time* it is submitted to their influence (§28). But this plan is not always followed; for by a number of operators the original plan of Daguerr·

* See § 81, for an account of the method of electro-silvering.

adopted, viz., the plate is allowed to remain over the iodine and bromine vapor until a certain color makes its appearance on the plate. For this purpose, an apparatus constructed as follows is used.

A mahogany box, inclosing a glass pan about three inches deep is made. On the top are a set of moveable frames to hold different sized plates, and directly under this is a piece of plate glass, which, sliding beneath the frames, serves as an air-tight cover to the glass pan. A portion of the back of the box is made to slide out or fall down so as to admit a ray of light through a piece of white paper placed over this part of the glass. In front, and immediately opposite to this opening, is a second, made to fall down, and on the inner portion of this is placed a piece of silvered glass, so that when held at a certain angle a distinct image of the plate is seen in the mirror, and the changes of color it may undergo at once rendered visible to the eye of the operator. Two of these boxes are required, one for applying the vapor of iodine, the other for the bromine or other accelerating agent.

In another form of this apparatus, both pans are placed in the same box, the frame holding the plate sliding in a groove from the one to the other; each is provided with a distinct glass cover. The frames for the plates should be well varnished when made in wood, or they are liable to absorb the iodine and bromine vapor, and prevent its coloring the edge of the plate.

23. *Iodizing.*—A few crystals of iodine should be distributed evenly over the bottom of one of the pans described, the plate should then be carefully placed, face downwards, in a frame over it, the iodine will slowly rise into vapor and attack the clean silver surface, which will gradually assume a variety of colors, according to the thickness of the coating of iodine; the first tint which will appear upon the plate is a pale yellow; this color gradually deepens until it assumes a deep golden color; from this it changes into very deep blood red,* and then immediately to pale rose; this rose tint deepens, and at last passes to a blue; by allowing the iodine to continue its action upon the plate, the blue gradually disappears and there is apparently little color upon the plate, but in reality a yellow color is again appearing, and if the action be still continued, the rose and blue again appear; in fact, the plate would assume a variety of colors, succeeding each other, just in the order of the first series.

24. Mr. Hunt has described a very interesting experiment on this subject. "If a piece of iodine be placed upon a silver plate and then gently warmed, a series of concentric colored rings will make their appearance. The first ring, which is constantly spreading, forms the exterior of the circle, is of a bright yellow color; within this there arises, successively, rings of green, red, and blue colors, and then again a fine yellow circle centered by a grayish spot occupied by the iodine. On exposing these to light, it will be found that the outer yellow circle almost instantly changes color, and that the others slowly change in the order of their positions, whilst the interior yellow circle resists, for a long time, the solar influence. It is an instructive experiment to form these rings, and cover one-half and expose the other to light; we shall thus be led to appreciate the proper color the plate should assume when exposed to the iodine vapor."

25. If iodine alone be used,† then it would appear that the second golden yellow color is the most sensitive to light, but since the discovery of the accelerating action of bromine or chlorine when combined with iodine on the plate, we have been led to believe that any of the *first series* of colors may be used on the plate provided we afterwards expose it for a *proportionate* time‡ to the bromine or chlorine; for in stance, if we only allow the plate to assume a golden yellow color, a very small quantity of bromine will make the plate very sensitive, but if the plate has been iodized to a full rose, then a larger quantity of bromine must be absorbed in order that the plate should be rendered sensitive; it is, therefore, obvious that any of the first series of

* These colors vary slightly when the light is allowed to fall on the plate in a different direction. The deep blood-red is a color very seldom seen; the plate must be very clean, and a good light must fall upon it for this tint to be visible.

† See an interesting paper by M. Claudet in the Phil. Mag., March 1848. He there states the second yellow to be twenty-five times more sensitive than the first.

‡ See table, § 28.

tints may be used, provided the operator is able to apply the *correct quantity* of bromine. We think the best tint for iodizing is a *full* golden yellow, nearly approaching the rose; and this tint a novice is perhaps the best able to appreciate, for it will generally be found, however evenly and skillfully the plate has been polished, that on some part of it a rose tint has made its appearance, when the other part has arrived at a full golden yellow; the most convenient method of determining the proper color, if the simple form of apparatus (§ 21 or 22) is used, is to allow a ray of light to enter the dark room and fall upon a piece of white paper; then to reflect the ray of light from the paper to the eye by means of the plate, and which, of course, will reflect its own color only. We speak of the "*dark room*," but it is not essential that the iodizing process should be carried on in the dark, it is only a matter of convenience, for the eye is better able to appreciate the right tint when there is no other light but that reflected from the plate. With the apparatus, (§ 22 and 23), we have only to look on the mirror until we perceive the plate is of the proper tint, and then close the pan; this is a much more convenient plan, for it saves the trouble of lifting the plate from the pan every time we wish to observe the color; after the plate has assumed the proper tint, it is then ready for the broming operation, which communicates the utmost degree of sensitiveness to the action of light.

26. In the process as originally described and patented by Daguerre, iodine alone was used for giving the plate its sensitive coating; for this purpose, he directed that after the plate had been well polished, it should be submitted to the vapor of iodine, until it assumed a golden yellow color, it was then ready for the action of light upon it, in the camera; and he stated, that if, by any inattention or mischance, the plate was suffered to go beyond this color and assume a rose or blue tint, it should be rejected and the whole process of polishing again gone through. The process with iodine alone was exceedingly slow; a portrait, which could be taken in ten seconds at the present time, would, if we followed the process of Daguerre, occupy at least half an hour, even with our improved forms of camera and object-glasses; and if the patented camera of Daguerre were used, we do not think an image could be obtained in double that time. Of course, no portrait could be produced, for it would be impossible to obtain a likeness, if the "patient" had to sit quite immoveable for that time. The proofs obtained at this time were exceedingly imperfect, and if no advances had been made in this original process, we have very little doubt that the term Daguerreotype would, in a short time have been but little known except to M. Daguerre, and by the records of the patent office. Fortunately, however, M. Claudet paid some attention to the subject, and obtained the first license for practising the art in England.

27. In some of the experiments of this gentleman, he found that the plate was rendered much more sensitive if it were exposed to chlorine, in addition to iodine; by this means he was enabled to obtain some tolerably good portraits. Since this time, the art has steadily progressed, and some of the proofs obtained by Kilburn, Claudet, and Mayall, are astonishing specimens of sun-drawn pictures; views are now obtained absolutely instantaneously; in fact, in some cases it is impossible to open and shut the camera *too* quickly. In order that the plate should acquire this extreme degree of sensitiveness, various methods are adopted: but in all the different plans, the vapor of bromine is made use of, either alone or in combination with chlorine or iodine. These different methods we shall describe, beginning with the most simple.

28. *Bromine Water.*—This may be prepared as follows:—pour into a glass stoppered bottle, nearly full of water, a few drops of bromine, and shake them together, the undissolved bromine will fall to the bottom, and the water will assume a bright red color; one part of this clear solution is to be added to about forty parts of water. This is readily and accurately accomplished by means of a graduated tube, or instead of using a measure, a certain tint of color may be obtained, in common water, by adding the saturated solution, drop by drop, until the required tint is produced, which must be previously determined by experiment. A bottle of water, tinged with gamboge, may be kept as a standard of comparison.

Bromine water can be used in any of the pans we have described. After having obtained, by the iodine, a full yellow color we transfer the plate to the bromine, we shall find it will continue to change in a similar manner, as if we had left it over the iodine; from the yellow it will speedily pass to a rose, and if we continue the action, it will change to a blue. By means of these changes, we ascertain the quantity of bromine applied to the plate. The following table shows the relative tints to be obtained on the plate when bromine water or the bromine of lime (§ 50) is used:—

1st. Iodine.	Bromine.	2d. Iodine
Straw color.	Yellow.	Full yellow.
Light yellow.	Golden yellow.	Rose.†
Golden yellow.	Light rose.	Deep rose.
Blood red.	Damask rose.	Light blue.
Damask rose.	Deep rose.	Blue.
Deep rose.	Light blue.*	Indication of 2d. yellow ‡

29. It will be observed, in the first column of this table, we have given the tints to be obtained by means of iodine; the plate is then placed over the bromine water, until it assumes the proper color for the particular tint to which it has been iodized; this is indicated in the second column. After this, the plate should be again placed over the iodine, until the color mentioned in the third column is obtained Too much care cannot be taken to get these relative quantities of iodine and bromine correctly upon the plate, for if there is too *small* a quantity of bromine in proportion to the iodine, the plate will not be very sensitive to the light, and it will be impossible to bring a proof fully "out," without being *solarized.* (§ 69) Again, if we put on too much bromine, the sensitiveness also diminishes, the plate becomes covered with a veil, the mercury will be found to deposit itself very readily on every part of the plate where it ought not, viz. on the deepest shadows, and very often over the whole surface; the "tone" of the proof is also very poor, and has a flat and cold gray appearance, and the plate will be *very* liable to solarize.

* This tint may be obtained by stopping the action when all the rose color has just disappeared.

† This tint is either a pale rose or a blood red according to the light. See note to § 23.

‡ At this time there is apparently little color upon the plate; it is just at the time the last trace of blue has disappeared.

30. There is a certain quantity of bromine necessary for each tint of iodine, and this exact quantity the photographer must obtain before he can expect a favorable result. If the full equivalent of bromine be applied, the operator will find that the proof will develop itself *very perfectly*, every part will be "done" enough, and *no part* solarized, even if the contrasts in the picture are very great; and the plate will also be found to be very sensitive, but as a drawback to this kind of picture, the tone is cold gray, the white parts are not very white and clear, and the whole has a flat appearance. This is the kind of picture generally obtained in France, and by the generality of American operators. If a *little less* bromine be applied, then the tone of the picture has changed; the white parts are very distinct and white, the shadows are very deep and black; this makes a fine bold picture; in the hands of some operators this method produces the finest pictures, and is practised by some of our first English artists, but some care is required in the management of the light, and the direction it is thrown upon the model, for the plate is more apt to solarize when prepared in this way, than when it has the full proportion of bromine.

31. We have described, in the preceding paragraph, a method of applying the requisite quantity of bromine, by noticing the color produced on the plate, just in proportion as the film of bromo iodide of silver is more or less thick. This plan is generally followed in England, but in France the greater number of operators have hitherto adopted a method first described by M. Fizeau, in a pamphlet published in Paris by that gentleman. His method is, to expose the plate for a certain time to a solution of bromine of a determinate strength; the solution is renewed for each plate. This plan we shall proceed to describe.

32 To prepare a solution of bromine of an ascertained degree of strength, and adapted to the operations we are speaking of, the first thing to be considered is, the saturated solution of bromine in water; this saturated water is prepared by putting into a bottle pure water, and a large excess of bromine; shake the mixture well for a few minutes, and before using it let all the bromine be taken up.

33. An ascertained quantity of this saturated water is then diluted in a given quantity of pure water, which gives a solution that is always identical; this dosing is performed very simply, in the following manner:—take a small glass tube, having marked on it a line, measuring a small quantity, fig. 6. Have also a bottle with a similar line, measuring a quantity equal to forty times that of the tube; then fill the bottle of water up to the mark, and fill the tube also to the mark with the saturated solution of bromine; then add this measure to the bottle of water.

34. The proportions above mentioned have been established when calculating upon having perfectly pure water; but it is well known that the water of river springs is not pure; but these different kinds of water may all be used with equal advantage, by adding a few drops of nitric acid, until they have a very slight acid reaction; five or six drops per quart suffice for most kinds of water.

35. A bright yellow liquid is then obtained, which must be kept perfectly air tight. It is the normal solution which we shall simply call bromine water, to distinguish it from the saturated water. The bromine pan should be flat-bottomed, and shallow; it should have an air-tight cover of plate glass. The form of apparatus, fig. 21, may be employed; the tube before mentioned being used for putting into the pan a determinate quantity of the bromine water; enough should be placed in the pan to cover the bottom of the vessel.

36. We have before stated, that the plate should be exposed to the bromine water of a certain strength, for a given time. Now, in order that the bromine water should be of the same strength in successive experiments, it is evident it must be renewed for each plate. This is the only practicable method of obtaining a constant quantity of vapor given off in the same time.

37. The time necessary for the plate to be exposed to the action of the bromine water, must be determined by experiment, for it will vary according to the size of the box, the quantity of liquid used, &c. It is usually between thirty and sixty seconds, and when once determined, it will be constant with the same box, and the same strength of solution.

38. The method of operating is as follows: place the pan upon a table, fill the pipette with bromine water, draw out a little way the glass slide, and allow the bromine water to run into the pan, and again close the vessel; the liquid must cover evenly the bottom of the pan; if not level it must be adjusted; the level will be easily seen through the glass slide. When everything is thus arranged, the iodized plate is to be placed in its frame over the pan; the slide withdrawn, and the necessary time counted; after this has elapsed, the side should be shut, and the plate immediately placed in the dark box of the camera.

39. For a second operation, this bromine water must be thrown away, and a fresh quantity used. The bottle containing the bromine water should be kept away from the direct light of the sun, and care should be taken that no organic matter fall into to the bottle, such as grease, chips of cork, &c. These enter into new combinations with the bromine, and lead to error as to its amount in solution.

40. This plan is very good in the hands of a careful operator, who will pay attention to the little matters which are necessary to ensure success; but we are much inclined to prefer, if we use bromine water, "working" to color, in the manner recommended.

To be continued.

GOSSIP.

WHEN Robert Fulton proposed the application of steam as a propelling power on board of vessels, he was not only laughed at by a great many old grannies, whose minds were too obtuse to comprehend either the great talents of the inventor, or the philosophy which had unravelled the principles and dictated the method of a system which has effected one of the greatest revolutions in the physical condition of mankind since the foundation of the world: but every obstacle was thrown in his way by many of his most intimate friends—who, considering him unsound in mind on the great subject which absorbed his whole soul, thought to do him a great service by opposing his, to them, wild schemes—in order to wean him from his folly.

But Fulton toiled on, living in a garret, frequently without a bare crust to sustain the wasting of his physical constitution under the harrassing cares, and debilitating studies and disappointed hopes that daily made his labors more irksome. Little had he to cheer him, during the first years of his experiments, and not until hope had almost departed did he meet with those who could appreciate and forsee the wonderful results to be derived from his invention. In every class of society, in every branch of business and in every scientific and artistic profession, we still find the same old grannies who constantly set their narrow-minded opinions against all things that are or appear new.

It cannot, therefore, be surprising to find such among our Photographers. It is the less surprising, when we reflect how few there actually are who really understand even the first principles of their art. There is not a man, woman, and we may even say child—where they know enough to understand a few practical instructions—who may not be taught in three hours to take a daguerreotype portrait, but how few of all those so taught can produce one of the least merit, or even a passable shadow.

We will venture to say that where there is one Photographer in this country who can take a portrait sufficiently excellent to be admissable to the cabinet of a man of true taste and refinement, there are twenty who are absolutely ignorant of what constitutes even a daguerrean shadow.

These are the men who tell you the art is susceptible of no improvement, and who invariably set their influences and energies against new processes, and new experiments. The mechanical portions of the daguerrean art are now so easy, that, no matter how much the picture may be improved by a new method, a fear lest the innovation should render it more complex and require more energy of mind than they possess, determines them to oppose all indiscriminately.

This we conceive to be one of, if not the principal, reason, why so few attempts are made by our operators to produce the paper photographs. There cannot be a doubt in the minds of any of those who have seen the exquisite specimens taken by M. Renard of Paris, which we now have in our possession, as to the ultimate fate of the Daguerreotype plate. Paper photography is making such rapid strides to perfection in Europe—particularly in France

—that but a very short time must elapse before this branch of the art will supercede the daguerreotype.

We confidently expect to see the day when photographs will be executed upon canvas, the size of life, quite equal in tone, in richness, and in detail, and far more accurate in drawing, and faithful as likenesses, than are the daguerreotypes of the present day.

We may be laughed at for expressing an opinion that now appears wild and extravagant, but we shall console ourselves with the reflection that greater men than we have been treated with the same species of wisdom. Let our readers, therefore, bear in mind that we now predict, that in less than ten years—probably five—those who live will see beautiful, full, life size photographs gracing the parlor walls of our people.

Photography is yet in its infancy, but with the aid of such men as Niepce, Evrard, Le Gray, Lacan, Renard, Ziegler, Macaire, Hunt, Herschel, Claudet, Draper, Whipple, Harrison, and many others, whose talents and enthusiasm are equal to the task, it will soon grow to manhood; and yet, more than ever, astonish by its wonderful productions, even those who now look upon it with sentiments of awe and amazement.

But this never will be accomplished in this country unless our operators devote more of their time to scientific research. It is a science, rather than an art—although intimately allied to the latter, and must become inseparable from it—and to rightly understand fully, and work out successfully the great principle it involves it is absolutely necessary to become acquainted with the two great branches of science, physics, or natural philosophy and chemistry.

It is, indeed, only the indolent, egotistic, and blindly ignorant who laugh at the discoveries of science, and mock at what they call "book learning."

Let us again ask these men where would have been the daguerrean art had not the experimentalists in science wrought out and developed it? Where would have been these very men, who will not study the progress of their art, and many hundred other daguerreotypists? Why, currying horses, or waiting in cheap eating houses.

We intend to pursue this subject indefinitely, until our operators are more generally imbued with the spirit of improvement than is now entertained. We will close it for the time being, however, by giving our readers the benefit of a letter on the same subject.

Chicago, Jan. 14th, 1852.

H. H. Snelling, Esq.

Dear Sir—Permit me to introduce to you my friend, Mr. Ostrom. By his hand I also forward to you five dollars, being my subscription to your excellent Journal for the 3rd and 4th volumes. It seems strange to me that there is so little desire amongst many of our operators in this part of the country to make themselves more intimate with the beautiful art they have adopted; but the why? is readily answered, when we consider the large numbe who enter the field believing it to be nothing more than a mere mechanical operation. Happily this belief carries with it its own reward;—in the many failures of success.

I am very glad to hear the Journal is so successful. I for one, should have missed it very much. Far away and isolated as we are out here makes a medium of that kind twice valuable, through which we may know what the world and the rest of mankind are about.

In subscribing to your second year, I cannot very well help to thank you for the benefits derived from your Journal of the first year. I am happy to say, and with pleasure do admit, that I have received more than tenfold the worth of my subscription,—and to a great extent I base my own success upon the information I have derived through your Journal. The past

year has been one of success to myself both pecuniarily and practically—but much more so in regerd to the improvements I have been able to make in my pictures.—I have passed the half-way house—have a clear field before me—and the words *fail* and *despondency*, won't be admitted to exist in my vocabulary.

I am about rebuilding my light more in accordance with the demand of Father Sun—and in expectation of a better time coming. We have severe cold weather at the present time.—But I will stop trespassing on your time, and merely wish you and yours a happy year, success to your Journal, and eminence to our beautiful art.

Yours, truly obliged,

GEO. P. HANSEN.

— We were very agreeably surprised by receiving the following poetry from one of our subscribers. The authoress is a practitioner of the Daguerrean art in the village of Salem ✕Roads, Chautauque Co. N. Y. To be a poetess and daguerreotypist, is synonymous with good taste and good pictures, and must secure warm friends and many of them.

THE HUSBANDS' DAGUERREOTYPE.

Mystic shadow, life portraying,
 Loved memento of the dead,
While I gaze, the tear-drops straying,
 Dims, like hearts whose joys are fled.

Treasured token ; memory lingers
 Fondly, sadly, on the past,
When those eyes, those lips, those fingers,
 Moved, and breathed, and gazed their last.

Tracing back Time's flowing current,
 Well remembered is the hour
When aroused by Love's knight errant,
 First was felt their magic power.

Nor are memory's links yet broken,
 Tho' sprinkled with the rust of time,
Since those sacred vows were spoken,
 And homage paid at wedlocks shrine.

Nor the soul-enkindling rapture,
 When these lineaments were traced,
With a parents' penetration,
 On a lovely cherub's face.

But the grave conceals the substance,
 Time this shadow may deface,
From the tablet of affection,
 Naught thine image can erase.

M. M. B.

— It will be remembered that we noticed in our last the announcement made in a western paper of an important improvement effected in the Daguerrean art by Mr. A. Hesler of Galena. We have since received a letter from Mr. Hesler, promising to furnish the details of the process at an early day, for the benefit of our readers. We cannot refrain from commending in the highest terms the liberality evinced by this truly excellent Photographer in thus giving to his fellow artists the results of his own experiments, without compensation. We must at the same time express our regret that there are to be found so few who emulate his example.

— We copy the following from La Lumiere:—

The inventors of Electro-Photography have promised us the communication of their process. In the meantime, we may announce that the proofs which these gentlemen have sent to the Academy of Sciences and Society of Encouragement, have excited in a very high degree the attention of the illustrious members of these two learned Societies. It is indeed very curious to see objects reproduced by photography in which the light of day acts no part, or be enabled to obtain portraits in the evening, and in the dark days of winter, with the same facility, and the same promptness as in the full glare of the sun and in the fine days of summer.

If MM. Aubree, Millet, and Leborgne wish to be in time, they will not fail to deliver to photographers the secret of their invention, since, as M. Francis Wey very truly observes, in speaking of M. Macaire's process, "we live in an age when, if we desire to conceal all, it is necessary at the same time to show nothing, and to reduce

every thing to the most profound silence, for, the impulsion towards heliographic advancement is so strong, and hopes are so sanguine, that it would perhaps be advisable to impart a secret to the whole world before it becomes the whole world's secret."

Since the above was translated, we have received the process from our translator, as published in the last number of La Lumiere. We give it here in order to lay it before our readers at the earliest possible day.

PROCESS OF ELECTRO-PHOTOGRAPHY.

Invented by MM. Aubree, Millet, and Leborgne, and presented to the Society for the promotion of National Industry, with several specimens of Daguerrean proofs in support of the invention.

Part 1st.—Obtaining sufficient electric light to reproduce a portrait; description of the piles; precautions to be taken.

To the Editor of La Lumiere:

SIR.—As we have promised you, our electro-photography process, we sincerely hope that it may be profitable to our colleagues, and it is this motive alone which actuates us in giving it publicity.

We admit that there has not been a great effort of the imagination, or genius on our part to demonstrate the possibility of obtaining portraits on plate and on paper by means of electric light. Some one may have conceived the idea before us; some one may still, to our detriment, have made these experiments before us with this luminous agent, but no one to our knowledge has either produced nor submitted, to the Academy of Sciences, or to the Society for the encouragement of national industry, complete Daguerrean proofs obtained by the effect of electric light. If such be the case, we are then right in claiming the legal priority of this discovery, and we consequently persist in considering ourselves the authors or inventors of electro-photography, although your witty but caustic correspondent of Rennes, remarks that he is not willing to acknowledge us as such.

It would be equitable on his part to make known to your readers the author or authors of this first application of electric light to photography, of which he speaks, with authentic accounts in evidence of a disputed right which we believe to be justly due to ourselves.

AUBREE, MILLET & LEBORGNE.

The battery which we use is composed of sixty piles of Bunsen, reversed, that is to say, the zinc surrounds the porous vessel or diaphragm which contains the coal, the whole is arranged as Grove's pile, only coal is substituted for platina.

Each of our piles is composed of an opaque porcelain vessel, of a circular shape, 26 centimetres high and 15 centimetres in diameter. Inside of this vessel is a plate of zinc half a centimetre thick and 28 centimetres in height, rolled into a cylindrical form, so that the sides may not touch; it is advisable to have a space of nearly 1 centimetre between the zinc and the walls of the vessel. Inside this cylinder of zinc put a vessel of porous earthenware, also cylindrical, and the same height as the porcelain vessel. Inside of this porous vessel put a piece of mineral coal, having removed the retorts in which the gas is cooled; it ought to be 30 centimetres high, and 6 centimetres thick. The pile being thus completed, rivet at the upper end of the zinc cylinder, upon one of the sides, a fillet of red copper 21 centimetres long, 3 centimetres wide, and 1 millimetre thick. This copper fillet is then applied and fixed to the upper end of the coal, by means of a small copper press.

All these pieces being thus prepared, you are ready to charge the pile. For this purpose, fill the porcelain vessel with sulphuric acid at a temperature of 6 degrees, and the porous vessel with the nitric acid of commerce to nearly twice its capacity. The pile is then changed and electricity constantly evolved until the total decomposition of one or the other acids is effected.

You thus connect sixty piles observing that all the zincs are always in communication with the coals by means of the copper fillets of which we speak. All these piles are arranged in a broken circle, in an apartment where a current of air may be readily produced in order not to be incommoded by the nitrous acid fumes which are liberated while the operation is carried on. At each end fasten a thread of red copper covered with cotton cord (to the zinc of the first pile and to the coal of the second)

long enough to communicate with a regulator containing the two coals which are to produce the electric light. The light obtained by this battery, will shine with the same brilliancy and intensity for five or six hours without sensible change.

The operator will have nothing more to do than to direct it properly upon the object which he desires to reproduce. It is necessary that the person should be brought as near as possible to this light, behind whom, and in close proximity, we place a pasteboard reflector of very white paper, perfectly adjusted. This reflection of light will materially diminish the time of exposition.

We have not judged it proper to give the description of our regulator since we are satisfied that we shall be able to procure it at a price infinitely less than what it would now cost.

However, if, for further intelligence, the model should be desired, we leave it at the disposal of our colleagues.

2nd part.—The plates which are to be used must be iodized a short time before operating. They will require to be iodized to a straw color, and then exposed over the following mixture, until it acquires the deep yellow color of gold.

Chloro bromide of lime, 125 grammes
Fluoride of bromine, 10 minims.

Mix the two substances in proper proportions, and do not use it until an hour has elapsed.

Again pass it over pure iodine and leave it until it acquires a fine Bengal rose color.

Time of Exposition.

For an engraving,	30 seconds.	
For a statue,	20 "	nearly
For a portrait,	60 or 80 "	

With a good reflector we can obtain it in much less time. We are at present engaged in making some experiments with electricity which will enable us, we hope, by means of electric light to obtain instantaneous proofs in the evening.

This process appears very simple, and, if it possesses all the merit claimed for it, is of considerable interest. Our photographers who may wish to try the experiment may obtain the battery by applying to Mr. Anthony, 308 Broadway, N. Y., or any of the stock dealers who advertise in our Journal.

— We take the following from the London Art-Journal:—

PHOTOGRAPHY.

Sir,—I venture to avail myself of your columns to communicate a result not unwelcome to those photographers who may not have already come upon it in their own practice. A very weak solution of protosulphate of iron (from 2 to 5 grains to the ounce of water, according to the collodion-iodide), slightly acidulated with either acetic or sulphuric acid, developes a more brilliant and powerful collodio-type picture, according to Mr. Horne's process, on glass, than the pyrogallic acid solution originally recommended. If the plate be inverted upon black cotton velvet, and secured by a little frame of pasted paper, the picture is seen direct, and constitutes its own glazing. When a negative for transfers is required, the exposure should be continued about one-fourth longer than for the best positive effect, until, indeed, the positive is weak and flat. The precipitated silver then has all the gradations of non-transparency, requisite for a most effective picture on paper. I may add that the blue tinge of the shadows, which sometimes spoils a picture, seems to arise from partial oxidation of the sulphate salt, and, in my own practice, has always been obviated by preparing the solution afresh. The effect of the hyposulphite fixing solution upon a picture so developed is extremely beautiful.

I have the honor to remain, Sir,
Yours very faithfully,
W. J. Read.
Collegiate House, Huddersfield.

[The use of the proto-sulphate of iron was first introduced by Mr. Robert Hunt, who read a paper on the subject at the Meeting of the British Association at York and published in its Transactions. From that communication, it appears to be applicable to almost every form of photographic manipulation into which a silver salt enters. We have no doubt but the process recommended by Mr. Read will prove very effective.]

— Mr. W. A. Allen, in connection with his brother, will open, in a few days, rooms at 308 Broadway, New York city. They are being fitted up in the handsomest manner, and from the reputation he has heretofore enjoyed, we have no doubt of his success both in getting good pictures and in doing a fine business.

— We have seen some very fine daguerreotypes taken by Mr. Warren, of Lowell, Mass. Two of them—Crayon daguerreotypes—are excellent to a degree, particularly that of Mr. Hale. The head of an old gentleman we consider a superior specimen. The tone is good and the outlines perfect, the lights and shades being very harmonious, with uniform gradations. Mr. Warren is a young operator, but he bids fair to stand at the head of his profession. We trust the good people of Lowell will bestow upon him that support he so richly deserves.

— Brady is still in Europe, gradually improving in health, and we may expect shortly to have him with us again. We understand that he contemplates opening a gallery in London. If so a fortune is before him, for he is not unknown to fame in England. His pictures have gone there before him and secured the admiration of all who have seen them.

— Mr. A. Bogardus, corner of Barclay and Greenwich streets, New York, has long claimed our attention, and he must excuse us for being so backward in noticing his genuine and deserved success in the art. We know of none in the art who is reaping a richer harvest. His dovotedness to business, gentlemanly deportment, and determination to please, has won for him friends who will never desert him.

— Those Crystal Palace prize pictures of Mr. Lawrence have safely arrived from London and may now be seen at his rooms. They are worth visiting, for they are truly superb. Those who go to see them will not come away without leaving a substantial proof of their approbation and receiving in exchange a fac simile of their own faces.

— We have lately received several letters complaining of the non-arrival of our Journal to subscribers. We can only say that the fault must be with the post office department. They are regularly mailed from this office. We have in every case when complaints of this kind have been made, sent duplicate copies. We trust all our subscribers will let us know, whenever like circumstances occur, when we shall be happy to make up their loss.

New York, Jan'y. 29, 1852.

Mr. Snelling. Dear Sir :—The following subscriptions for Daguerre's Monument have been received since your last:

Gabriel Harrison,	N. Y.	100	francs.
C. Fancourt, Jr.,	"	5	"
L. Ramsdell,	"	10	"
J. Ramsdell,	"	10	"
C. C. Harrison,	"	20	"

Truly yours,

Meade Bro's.

— We sent our friend "Wanderer" the numbers he desired, and hope he will have better success this time. We have received during the past month a great number of letters from our subscribers,—and others wishing specimen numbers—congratulating us on our editorial career, and recommending the Journal to their fellow Daguerreans. To all these evidences of friendship and aid we tender our most heartfelt thanks, and we trust that this

acknowledgement on our part, of these favors, will be deemed sufficient by all our correspondents, for we have found that to answer them all by letter would occupy more time than we actually have at our command. In order to edit the Journal we are obliged even now to encroach far into the midnight hours. Be pleased, therefore to take the will for the deed. To those who wished we have sent specimen numbers.

— Our friend, J. K. Fisher, Esq., having perfected his great invention of a *plank road steam carriage*, and received a most favorable report from the committee appointed by the American Institute to examine it, a company is now rapidly forming to put it into practical use. We shall speak further of this invention in our next.

— A young man of gentlemanly deportment, who is careful and neat in his habits, and who is a fine artistic and practical Daguerreotypist, can obtain a situation at the South, by applying to the editor of this Journal.

— As we were ready to go to press with our last forms, we received a copy of the *Prattsville Advocate*, containing the following article by the editor of that paper. We publish it for two reasons: first, because the editor assumes the responsibility of the discovery, after having been shown specimens of the Hillotype.—Secondly, because we pledged our word to Mr. Hill that we would publish any reasonable answer to our strictures, or those of others, that might appear in print. We freely offered our columns for that purpose, as an act of justice to the man, and, although he seems to have considered that our offer was insincere, as we judge from his having broken his promise to furnish us with an authentic statement written by another party—and his having endeavored to obtain the columns of various papers in which to make other statements—we do not consider that we are at liberty, to allow so important a document as the following to go unnoticed.

If the editor had not asserted that *he had seen the pictures which he describes*, we should have taken a different course, and commented at large upon the article. As it is we shall hold him strictly responsible. We will, however, remark that he shows very bad taste in calling all those who have reserved to themselves the right of forming their opinions and judging for themselves according to the evidence before them, Mr. Hill's *enemies*. We can speak for ourselves in this matter and say without equivocation, that we have not, even the least unfriendliness towards Mr. Hill, and most assuredly *no enmity*, and we defy Mr. Hill to accuse us of pursuing any other than a course of justice towards all parties, for we have the documents to show that any other, under the circumstances, would have been imbecile. We can also answer for many others. We shall rejoice at the complete success of Mr. Hill, when such an event takes place, most fervently, but—as we have said many times before—we must be free to act according to the evidence laid before us—but in doing so, feelings, either personal or otherwise, of illwill, do not actuate us. If Mr. Hill chooses, notwithstanding all our assurances to the contrary, to consider us his enemy, we cannot help it—we shall still pursue the course we think is right.

" On Tuesday last, we in company with a friend availed ourself of the pleasure of visiting the Rev. Mr. Hill, at his residence in Westkill, in this county, for the double purpose of seeing his specimens, and satisfying ourselves whether his discovery was in truth such an one as would stand the scrutinizing test of time, or whether it was emphatically a humbug—and reader here permit us to say that we acknowledge we had been assured by good authority that in

truth his discovery was all that he claimed it to be—but these statements fell far short of the reality. If we ever had any misgivings on the subject, they have forever passed from our mind; for what we saw with our own eyes, we must believe. Of Mr. Hill, all who have the pleasure of an acquaintance with him will agree with us in saying, that humbuggery forms no part of his character—that on his countenance are plainly seen the marks of disingenuousness—that he is far above playing the contemptible game of catch-penny. Mr. Hill has for some years been engaged in endeavoring, by a process hitherto unknown, of drawing out and fastening indelliby colors of every hue, exceeding in brilliancy anything that the pencil has ever as yet attempted—and that "consumation so devoutly wished for" he has succeeded in accomplishing. He has a mass of evidence in his possession which will soon be given to the world, from eminent Daguerrean artists and scientific men, establishing his right to the discovery—and from men who have spent years and years in attempting to find out the grand secret whereby he can in a life-like manner, present to the eye of the astonished beholder, colors true to nature; for instance, a blackberry bush with every leaf fresh as if now growing in its native soil, the stalk, the blossom, the green and ripe fruit, all perfect in color—all blended as harmoniously as the peerless art of Nature itself reveals them to our eye. Those who have for years been attempting to find out the discovery, and have as often failed, and who are now busy in decrying Mr. Hill for doing the very thing they have so long in vain strove to accomplish, will find to their utter dismay an avalanche of testimony, ere long, in favor of Mr. H's discovery, which will forever seal their mouths in silence, and shame the baseness of the motives by which they have long been actuated. His opponents may rest assured that Mr. Hill will pursue the "even tenor of his way," regardless of the threats of his enemies; and as soon as his health will permit he will convince the world of his right to a discovery never before known, and one which his traducers will yet be glad to learn from him.* We hazard nothing in saying that his discovery will be the crowning effort of the Daguerrean Art, and his fame is destined to outlive the noisy swarm of "little fry," who now pour out their anathemas upon him for accomplishing that which their genius can never hope to attain, much less excel; and time can never mar, corrupt or destroy his efforts—and while their names and acts shall be sunk in the muddy pool of oblivion, his will be classed with that of a Franklin, a Fulton, and other benefactors of mankind.

"His natural pictures, or rather his copies from nature, bore a more perfect resemblance to the original than any thing ever yet emanating from the pencil of the most accomplished artist. This is also emphatically true of the portraits of living persons taken by Mr. Hill, many of which we recognized.—Every lineament of the face was clearly defined; there was a truthfulness and beauty in them which the most world-renowned artist has never as yet been able to produce. No sane person will attempt to controvert the position that Daguerreotypes are (or have been) the most perfect likenesses it is possible to obtain, of the "human face divine," the process by which they are obtained admitting of not the slightest variation. They cannot be less true than the reflection of one's face in a mirror; but the crowning glory of the Hillotype consists in the truthfulness of feature and expression, a softness, a brilliancy of tone and nicety of shading hitherto unparalleled. These portraits are not easily defaced; and our attempt to mar their beauty only served to brighten them, and to more clearly portray their matchless elegance.

"We are not surprised that there are skeptics in regard to this matter—it is a matter of wonder that there are not more—but we are not one of them. Our eyes have seen, and we cannot do otherwise than believe. May a kind Providence grant him health and strength to complete (to his satisfaction, not our's, for we confess we thought it perfect,) his GLORIOUS ART."

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* This old excuse of ill health makes Mr. Hill a laughing stock, for whenever or wherever it is made, the remark is universal, "if he has health to enable him to devote his time to teaching the Daguerrean art he could most assuredly find time to perfect a process that would yield him one hundred fold greater profits, and in much less time." The remark is quite pertinent.

THE

PHOTOGRAPHIC ART-JOURNAL.

Vol. 3. MARCH, 1852. No. 3.

THE POETRY OF SCIENCE, OR STUDIES OF THE PHYSICAL PHENOMENA OF NATURE.*

BY ROBERT HUNT,
Author of 'Panthea,' 'Researches on Light,' etc.

WHAT curious metal, platinum, and also palladium, possesses a property of maintaining a slow combustion, which has been rendered available by the discovery of the safety-lamp to a very important purpose. If we take a coil of platinum wire, and, having made it red-hot, plunge it into an explosive atmosphere of carburetted hydrogen and common air, it continues to glow with considerable brightness, producing, by this peculiar influence, a recombination of the gasses, which is discovered by the escape of pungent acid vapors. Over the little flame of the safety-lamp a coil of platinum is suspended, and it is thus kept constantly at a red heat. If the miner becomes accidentally enveloped in an atmosphere of fire-damp, although the flame of his lamp may be extinguished the wire continues to glow with sufficient brightness to light him from his danger, through the dark winding passages which have been worked in the bed of fossil fuel.

It is thus that the discoveries of science, although they may appear of an abstract character, constantly, sooner or later, are applied to uses by which some branch of human labor is assisted, the necessity of man's condition relieved, and the amenities of life advanced.

The respiration of animals is an instance of the same kind of chemical phenomena as we discover in ordinary combustion. In the lungs the blood becomes charged with oxygen, derived from the atmospheric air, with which it passes through the system, performing its important offices, and the blood is returned to the lungs with the carbonic acid, formed by the separation of carbon from the body, which is thrown off at every respiration. It will be quite evident that this process is similar to that of ordinary combustion. In man or animals, as in the burning taper,—which is aptly enough employed by poets as the symbol of life,—we have hydrogen and carbon, with some nitrogen superadded; the hydrogen and oxygen form water under the vital forces; the carbon with oxygen produces carbonic acid, and, by a curious process, the nitrogen and hydrogen also combine to form ammonia.

All the carbon which is taken into the animal economy passes, in the process of time, again into the atmosphere, in combination with oxygen, this being effected in the body, under the *catalytic* power of tissues, immediately influenced by the excitation of nervous forces, which are the direct manifestations of vital energy. The quantity of carbonic acid thus given out to the air is capable of calculation, with only a small amount of error. It appears that upwards of fifty ounces of carbonic acid must be given off from the body of a healthy man in twenty-four hours. On the lowest

* Continued from vol. 3, No. 2, p. 84.

calculation, the population of London must add to the atmosphere daily 4,500,000 pounds of carbonic acid. It must also be remembered that in every process for artificial illumination, and in all the operations of the manufactures in which fire is used, and also in our arrangements to secure domestic comfort, immense quantities of this gas are formed. We may, indeed, fairly estimate the amount, if we ascertain the quantity of wood and coal consumed, of all the carbon which combines with oxygen while burning, and escapes into the air, either as carbonic acid or carbonic oxide. The former gas, the same as that which accumulates in deep wells or in brewers' vats, is highly destructive to life, producing very distressing symptoms, even when mixed with atmospheric air, in but slight excess over what it commonly contains. The oppressive atmosphere of crowded assemblies, is in a great measure due to the increased proportion of carbonic acid it contains. It will be evident to every one that, unless some provision was made for removing this deletrious gas from the atmosphere as speedily as it formed, consequences of the most injurious character to the animal races would ensue. It is found, however, that the quantity in the atmosphere is almost constant about one per cent. The peculiar properties of carbonic acid, in part, insure its speedy removal. It is among the heaviest of gaseous bodies, and it is readily absorbed by water; consequently, floating within a short distance from the surface of the earth, a large quantity is dissolved by the waters spread over it. A large portion is removed by the vegetable kingdom; indeed, the whole of that produced by animals, and by the processes of combustion, eventually becomes part of the vegetable world, being absorbed with water by the roots, and separated from the air by the peculiar functions of the leaves. However, the property of the diffusion of gasses explain the rapid mixing of this heavy gas with the lighter atmospheric fluid.

The leaves of plants may be regarded as performing similar offices to the lungs of animals. They are the breathing organs. In the animal economy a certain quantity of carbon is necessarily retained, in combination with nitrogen and other elements, to form muscle; but this constantly undergoing change;—the entire system being renewed within a comparatively limited period. The conditions with plants are somewhat different. For instance, the carbon is fixed in a tree, and remains as woody fibre until it decays, even though the life of the plant may extend over many centuries.

Animals, then, are constantly supplying carbonic acid; plants are as constantly feeding on it; thus is the balance forever maintained between the two kingdoms. Another condition is, however, required to maintain for the uses of men and animals the necessary supply of oxygen gas. This is effected by one of those wonderful operations of nature's chemistry which must strike every reflecting mind with admiration. During the night plants breathe carbonic acid; but there is a condition of repose prevailing then in their functions, and much of it passes off unchanged. With the first gleam of the morning sun the dormant organs of the plant are awakened into full action; they decompose this carbonic acid, secrete the carbon, to form the rings of wood which constitute so large a part of their structure, and pour out pure oxygen gas to the air. The plant is therefore, an essential element in the conditions necessary for the support of animal life. It must necessarily follow, that the inhabitants of the tropics do not produce so much carbonic acid as those who dwell in colder regions. In the first place, their habits of life are different, and they are not under the necessity of maintaining animal heat by the use of artificial combustion, as are the people of colder climes. The vegetation of the regions of the tropics is much more luxuriant than that of the temperate and arctic zones. Hence an additional supply of carbonic acid is required between the torrid zones, and a less quantity is produced by its animals. These cases are all met by the grand aërial movements. A current of warmed air, rich in oxygen, moves from the equator towards the poles, whilst the cooled air, charged with the excess of carbonic acid, sets in a constant stream towards the equator. By this means the most perfect equalization of the atmospheric conditions is preserved.

The carbonic acid poured out from the thousand mouths of our fiery furnaces,—produced during the laborious toil of the

hard-working artizan,—and exhaled from every populous town of this our island home —is borne away by the prevailing aërial currents to find its place in the pines of the Pacific Islands, the spice-trees of the Eastern Archipelago, and the cinchonas of Southern America. The plants of the valley of the Caucassus, and those which flourish amongst the Himalayas, equally with the less luxuriant vegetation of our temperate climes, are directly dependent upon man and the lower animals for their supply of food.

If all plants were removed from the earth, animals could not exist. How would it be if the animal kingdom was annihilated?—would it be possible for vegetation to continue? This question is not quite so easily answered, for it has been supposed that during the epoch of the coal formation a luxuriant vegetation must have gone on over the earth's surface, and the evidences of the existence of animal life during that period are but few. It is supposed that the air was then charged with carbonic acid, and that the calamites, lepidodendra, and sigillaria were employed to remove it, and fit the earth for the oxygen breathing races. The evidence upon these points is by no means satisfactory; and although at one time quite disposed to acquiesce in a conjecture which appears to account so beautifully for the observed geological phenomena of carboniferous periods, we do not regard the necessities for such a condition of the atmosphere as clearly made out.

In all probability the same mutual dependence, which now exists between the animal kingdoms, existed from the beginning of time, and will continue to do so under varying circumstances through the countless ages of the earth's duration.

There is yet another very important chain of circumstances which binds these two great kingdoms together. This is the chain of the animal necessities. A large number of races feed directly upon vegetables; herbs and fruits are the only things from which they gain those elements required to restore the waste of their systems.

These herbivorous animals, which must necessarily form fat and muscle from the elements of their vegetable diet, are preyed on by the carnivorous races; and from these the carbon is again restored to the vegetable world. Sweep off from the earth the food of the herbivora, they must necessarily very soon perish, and, with their dissolution, the destruction of the carnivora is certainly insured. To illustrate this, on a small scale, it may be mentioned that around the coasts of Cornwall, pilchards were formerly caught in very great abundance, in the shallow water within coves, where these fish are now but rarely seen. From the investigations of the Messrs. Couch, whose very accurate observations on the Cornish fauna have placed both father and son amongst the most eminent of British naturalists, it appears that the absence of these fish is to be attributed entirely to the practice of the farmers, who cut the sea-weed from the rocks for the purpose of manuring their lands. By this they destroy all the crustacea inhabiting these immature marine forests, feeding on the algæ, and as these, the principal food of the pilchards have perished, they seek for a substitute in more favorable situations. Mr. Darwin remarks that, if the immense sea-weeds of the Southern Ocean were removed by any cause, the whole fauna of these seas would be changed.

We have seen that animals and vegetables are composed principally of four elementary principles, oxygen, hydrogen, nitrogen, and carbon. We have examined the remarkable manner in which they pass from one condition—from one kingdom of nature—into another. The animal perishing and dwindling by decomposition into the most simple forms of matter, mingling with the atmosphere as mere gas, gradually becomes part of the growing plant, and by like changes vegetable organism progresses onward to form a portion of the animal structure.

A plant exposed to the action of natural or artificial decomposition passes into air, leaving but a few grains of solid matter behind it. An animal, in like manner, is gradually resolved into "thin air." Muscle, and blood, and bones, having undergone the change, are found to have escaped as gasses, leaving only "a pinch of dust," which belongs to the more stable mineral world. Our dependency on the atmosphere is therefore evident. We derive our substance from it—we are, after death, resolved again into it. We are really but fleet-

ing shadows. Animal and vegetable forms are little more than consolidated masses of the atmosphere. The sublime creations of the most gifted bard cannot rival the beauty of this, the highest and the truest poetry of science. Man has divined such changes by the unaided powers of reason, arguing from the phenomena which science reveals in unceasing action around him. The Grecian sage's doubts of his own identity, was only an extension of a great truth beyond the limits of our reason. Romance and superstition resolves the spiritual man into a visible form of extreme ethheariality in the spectral creations, "clothed in their own horror," by which their reigns have been perpetuated.

When Shakespeare made his charming Ariel sing—

> "Full fathoms five thy father lies,
> Of his bones are coral made,
> Those are pearls that were his eyes:
> Nothing of him that doth fade,
> But doth suffer a sea change
> Into something rich and strange;"

he painted, with considerable correctness, the chemical changes, by which decomposing animal matter is replaced by siliceous or calareous formation.

The mysteries of flowers have ever been the charm of the poet's song. Imagination has invested them with a magic influence, and fancy has almost regarded them as spiritual things. In contemplating their surpassing loveliness, the mind of every observer is improved, and the sentiments which they inspire; by their external elegance, are great and good. But in examining the real mysteries of their conditions, their physical phenomena, the relations in which they stand to the animal world, "stealing and giving odors" in the marvellous interchange of carbonic acid and ammonia for the soul inspiring oxygen—all speaking of the powers of some unseen, indwelling principle, directed by a Supreme Ruler—the philosopher finds subjects for deep and soul trying contemplation. Such studies lift the mind into the truly sublime of nature. The poet's dream is the dim reflection of a distant star: the philosopher's revelation is a strong telescopic examination of its features. One is the mere echo of the remote whisper of Nature's voice in the dim twilight; the other is the swelling music of the harp of Memnon, awakened by the sun of truth, newly risen from the night of ignorance.

To return from our long, but somewhat natural, digression, to a consideration of the chemical phenomena connected with the atmosphere, and its curious and important element, nitrogen, we must first consider the evidence we have of the condition of the air itself.

The mean pressure exerted upon the surface of the earth, as indicated by the barometer, is equal to a column of mercury thirty inches high; that is, the column of air pressing upon the open end of a bent tube filled with mercury, exactly balances that quantity, which represents a pressure of fifteen pounds upon every square inch of surface. This pressure, it must be remembered, is the compound weight of the gaseous envelop, and the elastic force of the aqueous vapor contained in it. If the atmosphere were of uniform condition, its height, as inferred from the barometer, would be about five miles and a half. The density of the air, however, diminishes with the pressure upon it, so that at the height of 11,556 feet the atmosphere is of half density: or one volume of air, as taken at the surface of the earth, is expanded into two. Thus the weight is continually diminishing; but this is regularly opposed by the decreasing temperature, which is at the rate of about one degree for every 352 feet of ascent, although in all probability it is less rapid at great distances from the earth.

It has been calculated from certain phenomena of refraction, that our atmosphere must extend to about forty miles from the surface of the earth. It may, in a state of extreme tenuity, extend still further; but it is probable that the intense cold produced by rarefaction, sets limit to any extension much beyond this.

The uses of the atmosphere are many. It is the medium for regulating the dispersion of watery vapors over the earth. If there was no atmosphere, and that, as now, the equatorial climes were hot and the poles cold, evaporation would be continually going on at the equator, and condensation in the colder regions. The sky of the tropical climes would be perpetually cloudless, whilst in the temperate and artic zones we should have constant rain and snow. By having a gaseous atmosphere,

a more uniform state of things is produced, the vapors evaporated from the earth become intimately mixed with the air, and are borne by it over large tracts of country, and only precipitated when they enter some stratum much colder than that which involves them. There are opposite tendencies in an atmosphere of air and one of vapor. The air circulates from the colder to the warmer parts, and the vapor from the warmer to the colder regions; and as the currents of the air, from the distribution of land and sea—the land from its low conducting power being more quickly heated than the sea—are very complicated, and as some force is employed in keeping the vapor suspended in the air, water is less suddenly deposited on the earth than it would have been, had not these tendencies of the air and its hygrometric peculiarities been as we find them.

The blue color of the sky, which is so much more agreeable to the eye than either red or yellow, is due to a tendency of the mixed gas and vapor to reflect the blue rays rather than red or yellow. The white light which falls upon the surface of the earth, without absorption or decomposition in its passage from the sun, is partially absorbed by, and in part reflected back from the earth. The reflected rays pass with tolerable freedom through this transparent medium, but a portion of the blue rays are interrupted and rendered visible to us. That it is reflected light, is proved by the fact of its being in a polarized state. Clouds of vapor reflect to us again, not isolated rays, but the undecomposed beam, and consequently they appear white as snow to our vision.

The golden glories of sunset,—when, "like a dying dolphin," heaven puts on the most gorgeous hues, which are continually changing,—depend entirely upon the quantity of watery vapor which is mixed with the air, and its state of condensation. It has been observed, that steam at night, issuing into the atmosphere under a pressure of twenty or thirty pounds to the square inch, transmits and reflects orange-red light. This we may, therefore, conclude to be the property of such a condition of mixed vapor and air, as prevails when the rising or setting sun is shedding over the eastern or the western horizon the glory of its colored rays.

Thus, science points out to us the important uses of the air. We learn that life and combustion are entirely dependent on it, and that it is made the means for securing greater constancy in the climates of the earth than could otherwise be obtained. The facts already dwelt upon are sufficient to convince every thinking mind, that the beautiful system of order which is displayed in the composition of the atmosphere, in which the all-exciting element, oxygen, is subdued to a tranquil state by another element, nitrogen, (which we shall have presently to show, is itself, under certain conditions, one of the most energetic agents with which we are acquainted,) indicates a Supreme power, omniscient in the adaptation of things to an especial end. Oxygen and nitrogen are here *mixed* for the benefit of man; man *unites* them by the aid of powers with which he is gifted, and the consequences are of a fatal kind. The principles which the great chemist of nature renders mild are transformed into sources of evil by the chemist of art.

Beyond all this, the atmosphere produces effects on light which add infinitely to the beauty of the world. Were there no atmosphere, we should only see those objects upon which the sun's rays directly fell, or from which they were reflected. A ray falling through a small hole into a dark room, illuminating one object, which reflects some light upon another, is an apt illustration of the effect of light upon the earth, if it existed without its enveloping atmosphere. By the dispersive powers of this medium, sunlight is converted into daylight; and instead of unbearable parallel rays illuminating brilliantly, and scorching up with heat those parts upon which they directly fall, leaving all other parts in the darkness of night, we enjoy the blessings of a diffusion of its rays, and experience the beauty of soft shades and slowly-deepening shadows. Without an atmosphere, the sun of the morning would burst upon us with unbearable brilliancy, and leave us suddenly, at the close of day, at once in utter darkness. With an atmosphere, we have the twilight with all its tempered loveliness,—a "time for poets made."

In chemical character, atmospheric air is composed of twenty one volumes of oxygen, and seventy-nine volumes of nitrogen:

or one hundred grains of air consist of 23.1 grains of the former, and 76.9 grains of the latter. Whether the air is taken from the greatest depths or the most exalted heights to which man has ever reached, an invariable proportion of the gases is maintained. The air of Chimborazo, of the arid plains of Egypt, of the pestilential delta of the Niger, or even of the infected atmosphere of an hospital, all give the same proportions of these two gasses, as we find existing on the healthful hills of Devonshire or in the air of the city of London. This constancy in constitution leads to the supposition that the oxygen and nitrogen are chemically combined; but many eminent philosophers have contended that they are merely mechanically mixed; and they have shown that some peculiar properties prevail amongst gaseous bodies, which very fully explain the equal admixture of two gases, the specific gravities of which are different. This is particularly exemplified in the case of carbonic acid, of which gas one per cent can be detected in all regions of the air to which the investigations of man have reached. This gas, although so heavy, is, by the law of diffusion, mixed with great uniformity throughout the mass. Every exhalation from the earth, of course, passes into the air; but these are generally either so light that they are carried into the upper regions and there perform their parts in the meteorological phenomena, or they are otherwise very readily absorbed by water or growing plants, and thus is the atmosphere preserved in a state of purity for the uses of animals. Again, the quantity of oxygen contained in the air, and its very peculiar character, insures the oxidation of all the volatile organic matters which are constantly passing off,—as the odoriferous principles of plants, the miasmata of swamps, and the products of animal putrefaction; these are rapidly converted into water, carbonic acid, or nitric acid, and quickly enter into new and harmless combinations. The elements of contagion we are acquainted with; but since the attention of enquirers has been of late directed to this important and delicate subjects, some light may possibly be thrown upon it before long.

Nothing shows more strikingly the adaptation of all things for their intended uses than the atmosphere. In it we find the source of life and health; and chemistry teaches us, most indisputably, that it is composed of certain proportions of oxygen and nitrogen gases; and experience informs us that it is on the oxygen that we are dependent for all that we enjoy. So beautifully is the atomic or molecular constitution ordered, that it is impossible to produce any change in the air without rendering it injurious to the animal and vegetable economy. It might be thought, from the well-known exhilarating character of oxygen gas, that, if a larger quantity existed in the atmosphere than that which we find there, the enjoyments of life would be of a more exciting kind; but the consequences of any increase would be exceedingly injurious; and, by quickening all the processes of life to an unnatural extent, the animal fabric would soon decay: excited into fever, it would be destroyed by its own fires. Chemistry has made us acquainted with six other compounds of oxygen and nitrogen, neither of them fitted for the purposes of vitality, of which the following are the most remarkable:—

Nitrous oxide, or the celebrated laughing gas, which contains two volumes of nitrogen to one of oxygen, would prove more destructive than even pure oxygen, from the delirious intoxication which it produces.

Nitric oxide is composed, according to Davy, of two volumes of nitrogen and two of oxygen. It is of so irritating a nature that the glottis contracts spasmodically, when any attempt is made to breathe it; and the moment it escapes into air, it combines with more oxygen, and forms the deep red fumes of nitrous acid.

Nitrous acid, and the peroxide of nitrogen, each contains an additional proportion of oxygen, and they are still more destructive to all organization.

Nitric acid contains five volumes of oxygen united to two of nitrogen; and the well-known destructive properties of aqua fortis it is unnecessary to describe.

The atmosphere, and these chemically active compounds, contain the same elements, but their mode of combining is different; and what is, in the one case, poisonous to the highest degree, is, in the other, rendered salubrious and essential to all organized beings.

Nitrogen gas may be regarded in the light of a diluent to the oxygen. In its

pure state it is only characterized by its negative properties. It will not burn, or act as a supporter of combustion. Animals speedily perish if confined in it; but they die rather through the absence of oxygen than from any poisonous property of this gas. Yet, in combination, we find nitrogen exhibiting powers of a most energetic character. In addition to the fulminating compounds, and the explosive substances already named, which are among the most remarkable instances of unstable affinity with which we are acquainted, we have also the well-known pungent body ammonia. From the analagous nature of this volatile compound, and the fixed alkalies, soda, and potash, it was inferred that it must, like them, be an oxide of a metallic base. Davy exposed ammonia to the action of potassium, and to the influence of the voltaic flame produced from 2,000 double plates, without at all changing its character. From its slight tendency to combination, and from its being found abundantly in the organs of animals feeding on substances that do not contain it, it is, however, probably a compound body. A phenomenon of an obscure and mysterious character is presented in the formation of the "ammoniacal amalgam," as it is called.

Mercury, being mixed with an ammoniacal salt, is exposed to powerful galvanic action; and a compound, maintaining its metallic appearance, but of considerable lightness and very porous, presents itself. This preparation has been carefully examined by Davy, Berzelius and others. It is always resolved into ammonia and mercury; and, although the later chemist is strongly inclined to regard it as affording evidence of the compound nature of nitrogen,—and he has, indeed, proposed the name *nitricum*, for its hypothetical base,—yet, to the present time, we have no satisfactory explanation of this metallization of ammonia.

No attempt will be made to describe the various elementary substances which come under the class of metallic bodies, much less to enumerate their combinations. Many of the metals, as silver and copper, are found sometimes in a native state, or nearly pure; but for the most part, they exist, in nature, in combination with oxygen or sulphur—gold furnishes a remarkable exception. They are ordinarily found combined with other bodies, as oxidized carbon phosphorus chlorine, &c.; but these cases are by no means so common. These substances called metals are generally found embedded in the rocks, or deposited in fissures formed through them; but it is one of the great discoveries of modern science, that those rocks themselves are metallic oxides. With metals, we generally associate the idea of great density; but potassium and sodium, the metallic bases of potash and soda, are lighter than water, and they, consequently, float upon that fluid. We learn, therefore, from the researches of science, that the crust of this earth is composed entirely of metals, combined with gaseous elements; and there is reason for believing that one, or perhaps two, of the gasses we have already named, are also of a metallic character. Strange as it may appear, there is nothing, as will be seen on attentive consideration, irrational in this idea. Many of the metals proper, under the influence of such heat as we can, by artificial means, command, are dissipated in vapor, and may be maintained in this state perfectly invisible. Indeed, the transparent space above the surface of the mercury in the tube of a barometer, known as the Torricellian vacuum, is filled with the vapor of mercury. There is, therefore, no reason why nitrogen, or even hydrogen. should not be metallic molecules kept by the force of the repulsive powers of heat, or some other influence, at a great distance from each other. The peculiar manner in which nitrogen unites with mercury, and the property which hydrogen possesses of combining with antimony, zinc, arsenic, potassium, sodium, and possibly other metals, besides its union with sulphur and carbon,—in all which cases there is no such change of character as occurs when they combine with oxygen—appear to indicate bodies which, chemically, are not very dissimilar to those metals themselves, although, physically, they have not the most remote resemblance.

"We know nothing," says Davy, "of the true elements belonging to nature; but so far as we can reason from the relations of the properties of matter, hydrogen is the substance which approaches nearest to what the elements may be supposed to be. It has energetic powers of combination, its

parts are highly repulsive as to each other, and attractive of the particles of other matter; it enters into combination in a quantity very much smaller than any other substance, and in this respect it is approached by no known body."

Many of the elements are common to the three kingdoms of nature: most of those found in one condition of organization are found in another. In the vegetable class we find carbon combining with oxygen, and hydrogen, and an inferior quantity of nitrogen. The carbonates are an abundant mineral class. These elements also, constitute the substance of animals, the proportion of nitrogen being in them much larger. If one element, more than another, belongs especially to the animal economy, it is phosphorous, although this is not wanting in the vegetable world; and it is not uncommon in the mineral. Sulphur is common in the three classes: it is abundant in the mineral kingdom, being one of the products of volcanic action; it is united with the metals, forming sulphurets; it combines with the metallic bases of lime and other earths, and is found in our rocks in the state of sulphuric acid or oxidized sulphur. In the vegetable kingdom we discover sulphur in all plants of the onion kind, in the mustard and some others; and it enters into the composition of vegetable albumen, and appears always combined with albumen, fibrine, and caseine in the animal economy.

Chlorine is found most abundantly in combination with sodium, as common salt; in this state, in particular, we may trace it from the depths of the earth, its waters, and its rocks, to the plants and animals of the surface. Iodine is most abundant in marine plants; but it has been found in the mineral world. Bromine is known to us as a product of certain saline waters, and a few specimens of natural bromide of silver have been examined. Fluorine the base of the acid which, combining with lime, forms fluor spar, is found to exist to some considerable extent in the bones of animals. It must not be forgotten that the earths enter into the composition of the more solid parts of plants and animals. Silica, or the earth of flints, is met with in beautiful transparent crystals, in the depths of the mine; in all rocks and soils we find it; in the barks of many plants, particularly the grasses, it is discovered, forming the hard supporting cuticle of the stalk of wheat, the Dutch rush, the sugar-cane, the bamboo, and many others. Lime is one of the principal constituents of animal bone and shells, and it is found in nearly all vegetables.

It is thus that we find the same elementary principle presenting itself in every form of matter, under the most Protean shapes. Numerous phenomena of even a more striking character than those selected, are exhibited in chemistry; but within the limits of this essay it is impracticable to speak of any beyond those which directly explain natural phenomena.

The chemical elements, which actually exist in nature as simple bodies, are probably but few. Most of the known gases, and sulphur, phosphorus, and the metals, are in all probability compounds of some ethereal ultimate principles; and with the advance of science we may fairly hope to discover the means of reducing some of them to a yet more simple state. The speculations of men, through all ages, have leaned towards this idea, as is shown by the theory of the four elements of the ancients, the three of the alchemists, and the refined speculations of Newton and Boscovich. All experimental inquiry points towards a similar conclusion. It is true we have no direct evidence of any elementary atom actually undergoing a change of state; but when we regard the variations produced by electrical influence, and consider the phenomena of allatropism, it will be difficult to come to any other conclusion, than that the particles of matter known to us as ultimate are capable of change, and consequently must be far removed from positively simple bodies, since the real elementary atom, possessing fixed properties, cannot be supposed capable of undergoing any transmutation.

It will now be evident that in all chemical phenomena we have the combined exercise of the great physical forces, and evidences of some powers which are, as yet, shrouded in the mystery of our ignorance. The formation of minerals within the clefts of the rocks, the decomposition of metallic lodes, the germination of seeds, the growth of the plant, the development of its fruit, and its ultimate decay, the secret processes of animal life, assimilation, digestion, and

respiration, and all the changes of external form which take place around us, are the result of the exercise of that principle which we call chemical.

By chemical action plants take from the atmosphere the elements of their growth; these they yield to animals, and from these they are again returned to air. The viewless atmosphere is gradually formed into an organized being, which as gradually is again resolved into the thin air. The changes of the mineral are of an analogous character; but we cannot trace them so clearly in all their phenomena.

An eternal round of chemical action is displayed in nature. Life and death are but two phases of its influences. Growth and decay are equally the result of its power.

CHAPTER XIII.

TIME.—GEOLOGICAL PHENOMENA.

Time, an element in Nature's Operations—Geological Science—Its Facts and Inferences—Nebular Hypothesis applied—Primary Formations—Plutonic and Metamorphic Rocks—Transition Series—Palæozoic Rocks—Commencement of Organic Arrangements—Existence of Phosphoric Acid in Plutonic Rocks—Fossil Remains—Coal Formation—Sand-stones—Tertiary Formations—Eocene, Miocene, and Pliocene Formations—Progressive changes now apparent—General Conclusions—Physics applied in Explanation.

The influence of time, as an element, in producing certain structural arrangements, by modifying the operations of physical force, under whatever form it may be exerted, has scarcely been sufficiently attended to in the examination of cosmical phenomena. Every particle of matter is, as it were, suspended between the agencies to which we have been directing our attention. Under the influences of the physical powers, sometimes exerted in common, but often with a great preponderance in favor of one of them, every accumulated heap of mud or sand is slowly cohering, and assuming the form of a rock possessing certain distinguishing features, as it regards lamination, cleavage, &c.

The minute particles of matter are necessarily but slightly influenced by the physical forces; their action, in accordance with the laws which determine physical condition, is manifested in an exceedingly modified degree. But in all the operations of nature, what is deficient in power is made up in time, and effects are produced during myriads of ages, by powers far too weak to give satisfactory results by any experiments which might be extended even over a century.

If, with the eye of a geologist, we take but a cursory glance over the earth, we shall discover that countless ages must have passed during the progress of this planet to its present state. This is a fact written by the finger of nature, in unmistakeable characters, upon the mighty tablets of her mountains.

The superficial crust of the earth,—by which is meant only that film,—compared with its diameter,—which is represented by a few miles in depth—is composed of distinct mineral masses, exhibiting peculiar physical conditions and a certain order of arrangement These rocks appear to have resulted from two dissimilar causes; in the one class the action of heat is evident, and in the other we have an aqueous origin indicated by peculiarities of formation.

There are few branches of science which admit of speculation to the extent to which we find it carried in geology. The consequences of this is shown in the popular character of the science A few observations are made over a limited area, and certain structural conditions are ascertained, and at once the mind, "fancy free," penetrates the profound depths of the earth and imagination, having "ample room and verge enough," creates causes by which every effect is to be interpreted. Such students, generally ignorant of the first principals of physics, knowing little of mineralogy, and less of chemistry, to say nothing of palæontology, having none of the requisites for an observer, boldly assumes premises which are untenable, and think they have explained a phenomenon,—given to the world a truth,—when they have merely promulgated an unsubstantiated speculation, which may have occasional marks of ingenuity, and but little else.

The carefully made observations of those who, with unwearying industry, have traversed hill and valley, marked and measured the various characters, thicknesses, inclinations, and positions of rocks; who have watched the influences of heat in

changing, of water in wearing, and the results of precipitation in forming strata; who have traced the mechanical effects of earthquake strugglings and of volcanic eruptions, and, reasoning from an immense mass of accumulated facts, deduced certain general conclusions,—are, however, of a totally different character; it is such observers as these who induced Herschel to say truly, that "geology, in the magnitude and solemnity of the objects of which it treats, undoubtedly ranks, in the scale of the sciences, next to astronomy."

The origin of the planet is involved in great obscurity, which the powers of the most gifted are unable to penetrate. It stands the work of an Almighty and Eternal mind, the beginning of which we cannot comprehend, nor can we define the period of its termination.

It may, probably, be safe to speculate that there was a time when this globe consisted of only one homogeneous stratum. Whether this remains,—whether, in our plutonic rocks, our granites, or our porphyries, we have any indications of the primitive state of the world, or whether numerous changes took place before even our unstratified formations had birth, are questions we cannot answer. The geologist looks back into the vista of time, and reckons, by phenomena, the progress of the world's mutations. The stratified formations may have occupied thousands of ages; but before these were, during a period extending over countless thousands, the unstratified rock may have been variously metamorphosed. It matters not whether we admit the nebular hypothesis or not, a time must have been when all these bodies which now form the mass of this globe existed in the most simple state. We have already shown that very remarkable changes in external character and in chemical relations are induced, in the same simple element, by its having been exposed to peculiar and different conditions; and already have we speculated on the probability that the advance of science will enable us to reduce the numerous elements we now reckon to two or three. It is, therefore, by no means an irrational thought to suppose, that at the beginning a mighty mass of matter, in the most attenuated state, floated through space, and was gradually, under the influence of gravitation, of cohesive force, and of chemical aggregation, moulded into the form of a sphere. Ascending to the utmost refinement of physics, we may suppose that this mass was one of uniform character, and that it became in dissimilar parts—its surfaces and towards its centre—differently constituted, under the influences of the same powers which we now find producing, out of the same body, charcoal and the diamond, and creating the multitudinous forms of organized creations. These conditions being established and carried to an extent of which, as yet, science has afforded no evidence, chemical intermixture may have taken place, and a new series of compounds have been formed, which, by again combining, gave rise to another and more complex class of bodies.

The foundation of the superficial crust of the earth appears to be formed of a class of rocks which have resulted from the slow cooling of an immense mass of heated matter. These rocks have been called *igneous;* but are now more generally termed *Plutonic*, (such as granites, syenites, &c.) Immediately above these, we find rocks which have resulted by deposition from water. These masses, having been exposed to the action of the heat below, have been considerably changed in their character, and hence they are often called *metamorphic;* but metamorphic rocks may, however, be of any age. The rocks formerly termed the *transition* series—from their forming the connecting line between the earlier formations—are now, from the circumstances of their being fossiliferous, classed under the general term of palæozoic rocks, to distinguish them from the rocks in which no organic remains have been found. Above these are found the secondary strata, and, still more recently produced, we have a class now usually denominated the tertiary formations. "Eternal as the hills" is a poetic expression, implying a long duration; but these must, from the nature of things, eventually pass away. The period of time necessary for the disintegration of a granite hill is vastly beyond the powers of computation, according to our conception of the ordinary bounds of finite things. But a consideration of the results of a few years,—under the influence of the atmosphere and the rains,—as shown in quantity of solid matter carried off by

the rivers, and deposited at their mouths, will tend to carry conviction to every mind, that a degrading process is forever in action on the surface of the earth. The earth itself may be eternal, but the surface is continually undergoing mutation, from various causes, many of which we must briefly consider.

In regarding geological phenomena, the absence of any fossil remains has often been supposed to indicate a period previous to any organic formations. That the inorganic constituents of matter are of prior origin to the organic combinations is a speculation which must be cautiously received. The supposed evidences in favor of such an assumption are in some respects doubtful, and we can well understand that changes may have been induced in the earlier rock formations, by heat or by other powers, quite sufficient to destroy all traces of organized forms. It was long thought that phosphoric acid was not to be detected in rocks which are regarded as of igneous origin; and since this acid is peculiarly a constituent of organic bodies, this has been adduced as a proof that the plutonic rocks must have existed previously to the appearance of vegetable or animal life upon the surface of the globe. The researches of modern chemists have, however, shown that phosphoric acid is to be found in formations of granite origin, in porphyry, basalt, and hornblende rocks. If, therefore, we are to regard this substance as of organic origin, the rational inference is against the speculation.

Without attempting to enter into any account of the apparent progress of life over the earth, it appears desirable that some description should be given of the kinds of plants and animals which we know to have existed at different epochs. We shall thus learn, at least, some of the prevailing characteristics of the earth during its transitions, and be in a better condition for applying our knowledge of physical power to the explanation of the various geological phenomena.

Among the earliest races, we have those remarkable forms, the trilobites, inhabiting the ancient ocean.

These crustacea bear some resemblance, although a very remote one, to the common wood-louse, and, like that animal, they had the power of rolling themselves into a ball when attacked by an enemy. The eye of the trilobite is a most remarkable organ; and in that of one species, *Phacops caudatus*, not less than two hundred and fifty lenses have been discovered. This remarkable optical instrument indicates that these creatures lived under similar conditions to those which surround the crustacea of the present day.

At the period of the trilobites of the Silurian rocks, all the animals contemporaneous with them had the organs necessary for the preservation of life in the waters.

Next in order of time to the trilobite, the most singular animals inhabiting those ancient seas, whose remains have been preserved, are the *Cephalopoda*, possessing some traces of organs which belong to vertebrated animals. There are numerous arms of locomotion and prehension, arranged in a centre round the head, which is furnished with a pair of sharp, horny mandibles, embedded in powerful muscles. These prehensile arms are provided with a double row of suckers, by which the animal seized its prey. Of these cephalopodous animals there are many varieties, but all of them appear to be furnished with powers of rapid locomotion, and those with shells had an hydraulic arrangement for sinking themselves to any depth of the seas in which, without doubt, they reigned the tyrants.

Passing by without notice the numerous fishes which appear to have exhibited a similar order of progression to the other animals, we must proceed to the more remarkable period when the dry land first began to appear.

All the animals found in the strata we have mentioned, are such as would inhabit the seas; but we gradually arrive at distinct evidence of the separation of the land from the water, and the "green tree, yielding seed," presents itself to our attention; not that the strata earlier than this are entirely destitute of any remains indicating vegetable growth, but those they exhibit are such as, in all probability, may be referred to marine plants.

Those plants, however, which are found in the carboniferous series are most of them distinguished by all the characteristics of those which grow upon the land; we, there-

fore, in the mutilated remains of vegetation left us in our coal-formations, read the history of our early world.

Then the reed-like calamite bowed its hollow and fragile stems over the edges of the lakes, the tree-ferns grew luxuriantly in the shelter of the hills, and gave a wild beauty to the humid valleys. The lepidodendrons spread themselves in mighty forests along the plains, which they covered with their curious cones; whilst the sagillariæ extended their multitudinous branches, wreathing like serpents amongst their luxurious vegetation, and embraced with their roots (stigmariæ), a most extensive space on every side.

The seas and lakes of this period abounded with minute animals nearly allied to the coral animals, which are now so actively engaged in the formations of islands in the tropical and southern seas. During the ages which passed by without any remarkable disturbance of the surface of the earth, the many bands of mountain limestone were formed by the ceaseless activity of these minute architects. Encrinites (creatures in some respects resembling star-fish) existed in vast numbers in the oceans of this time; and the great variety of bivalve shells, and those of a spiral character, discovered in the rocks of this period, show the waters of the newer palæozoic period to have been instinct with life.

In the world, then, as it does now, water acting on the dry land produced remarkable changes. We have evidence of extensive districts over which the most luxuriant vegetation must have spread for ages, —from the remains of plants in every state of decay,—which we find went to form our great coal-fields. These, by some changes in the relative levels of land and water, became covered with this fluid; and over this mass of decaying organic matter, sand and mud were for ages being deposited. At length, rising above the surface, it becomes covered with vegetation, which is, after a period, submerged; the same deposition of sand and mud again takes place, it is once more fitted for vegetable growth, and thus. cycle after cycle, we see the dry land and the water changing places with each other. This will be evident to every one who will carefully contemplate a section of one of the coal-fields of Great Britain. We find a stratum of clay lying upon a bed of underclay, and above it an extensive stratum of shale or sand-stone, probably formed by the denudation of the neighboring hills; and in this manner we have many strata of coal, shale, clay, ironstone, and sandstone alternating with each other.

Ascending in the series, we have now formations of a more recent character, in which fishes of a higher order of organization, creeping and flying saurians, crocodiles and lizards, tortoises, serpents, and frogs, are found. The lias formations (a term corrupted from *layers*), consisting of a strata in which an argillaceous character prevails, stand next in series. In these we have animals preserved in a fossil state, of a distinguished different character from those of the inferior strata. Corals are not found in the British Isles; but we meet with extended beds of pentacrinites, some inches in thickness; and their remains are often so very complete that every part of the skeleton can be made out, although so complicated that it cannot consist of less than 150,000 parts. In these formations we often find the curiously beautiful remains of the ammonites, of which an immense variety have been found. Of the belemnites—animals furnished with the shell and the ink-bag of the cuttle-fish, with which it darkened the water to hide itself from enemies—numerous varieties have also been discovered. In addition to these we have nautili; and sixty species of extinct fishes have been described by Agassiz from the lias of Lyme Regis alone.

When these rocks were in the progress of formation, there existed the ichthyosaurus, or fish-lizard, which appears, in many respects, to have resembled the crocodile of the Nile. It was a predatory creature of enormous power, and must have been the tyrant and terror of the seacoasts which it inhabited. Its alligator-like jaws, its powerful eye, its fish-like fins, and turtle like paddles, were all formed to facilitate its progress as a destructive agent. The plesiosaurus was, if possible, a still more remarkable creation. To the head of a lizard was united an enormously long neck, a small and fish-like body, and the tail of a crocodile; it appears formed for existence in shallow waters, so that, when moving at the bottom, it could lift its head above the surface for air, or in search of

its food. The flora of this period must have been tolerably extensive: and it resembled the vegetation which exists at present in tropical regions.

Races of reptiles still have place upon the earth, and we have now the megalosaurain remains indicating a strength and rapacity which would render them objects of terror as well as astonishment, could they be restored to the world which they once ravaged. An enormous bat-like creature also existed at this time—the pterodactyl—which, in the language of Cuvier, was, "undoubtedly, the most extraordinary of all the beings of whose former existence a knowledge is granted to us, and that which, if seen alive, would appear most unlike anything that exists in the present world." "You see before you," says the same writer, "an animal which, in all points of bony structure, from the teeth to the extremities of the nails, presents the well known saurian characteristics, and of which no one can doubt that its integuments and soft parts, its scaly armor and its organs of circulation and reproduction, are likewise analagous. But it was, at the same time, an animal provided with the means of flying; and, when stationary, its wings were probably folded back like those of a bird, although, perhaps, by the claws attached to its fingers, it might suspend itself from the branches of trees."

From the disintegration of the older rocks have no doubt risen those formations which are known as the oolitic series. In these strata are preserved the remains of plants and animals more resembling those which now exist upon the earth; and, for the first time,—unless the evidence of the footsteps of birds on the new red sandstone of America be accepted,—we meet with the remains of winged creations.

In these formations we discover animals belonging to the class mammalia,—the amphitherium and the phascolotherium,—which appear to have resembled, in many respects, the marsupial animals of New Holland.

The wealden formations, which are the next in order of position, are a series of clays and sands, with subordinate beds of limestone, grit, and shale. These have in some instances, been formed in tho sea; but they may be usually regarded as fresh water deposits. All the older rocks bear evident marks of marine origin, unless some of the coal-measure strata may be regarded as otherwise; but nearly all the wealden series contain the remains of land, fresh water, estuary animals, and of land vegetables. The animals which we discover, preserved, to tell the history of this period, are numerous, and have marked peculiarities to distinguish them from those already described, or from any now existing on the earth. We find land saurians of a large kind, and animals of all sizes, even insects, of which a great variety are found in the wealds. The remarkable iguanodon was an animal which, even by the cautious measurement of Professor Owen, must have been at least twenty-eight feet long; and this enormous creature was suspected, by Cuvier, and has been proved by Owen, to have been "an herbivorous saurian for terrestrial life." Dr. Mantell calculates that no less than seventy individuals of the iguanodon of all ages have come under his notice; and the bones of a vast number of others must have been broken up by the workmen in the few quarries of Tilgate grit; so that these creatures were by no means rare at the period of their existence.

The uppermost of these secondary formations is the cretaceous or chalk group, which spreads over a large portion of south-eastern England, and is met with in all parts of Europe. This chalk, which is a carbonate of lime, appears to have been slowly precipitated from tranquil water, as according to Sir Henry De la Beche, organic remains are beautifully preserved in it. Substances of no greater solidity than common sponges retain their forms, delicate shells remain unbroken, fish even are frequently not flattened, and altogether we have the appearances which justify us in concluding that, since these organic exuviæ were entombed, they have been protected from pressure by the consolidation of the rock around them.

Beneath the chalk exists what has been called, from its color—derived from a silicate of the protoxide of iron,—green sand, and was, no doubt, formed by deposition from the same water in which the carbonate of lime was suspended,—the green sand falling to the bottom more readily from its greater specific gravity. "The

tranquility," observes Sir Henry De la Beche, "which seems to have prevailed during this great accumulation of siliceo-calcareous matter, whether it may have been a deposit from water, in which it was mechanically suspended, partly the work of living creatures, or in a great measure chemical, is very remarkable."

In the chalk, the remains of the dicotyledonous plants and fragments of wood are found more abundantly than in the earlier strata, many of which are marked with the perforations of marine worms, indicating that they had floated for some time in the ocean. It should, however, be remembered, that leaves have been found in the new red sandstone; and the flora of the coal formation must not be forgotten. The manner in which silica has deposited itself on organic bodies—the sponges—is curious; the whole of the organized tissue being often removed, and flint having taken its place. These flints abound in the upper chalk. The association of carbon and silicon, combined with oxygen, as we find them in the cretaceous formations, is most interesting, and naturally gives rise to some speculation on the relation of these two elements. Both carbon and silicon, as has been already shown, exist in several allotropic conditions; and, although the statements made by Dr. Brown relative to the conversion of carbon into silicon are proved to be grounded on experimental error, it is not improbable that a very intimate relation may exist between these elements. The probability is, that the sponge animal has the power of secreting silica to give strength to its form. "Many species," says Rymer Jones, speaking of recent sponges, "exhibiting the same porous structure, have none of the elasticity of the officinal sponge—a circumstance which is due to difference observable in the composition of their skeletons or ramified framework. In such, the living crust forms within its substance not only tenacious bands of animal matter, but great quantities of crystallized spicula, sometimes of a calcareous, at others of a siliceous, nature." Thus, a frame of siliceous matter being formed by the living animal, a deposition of the same substance is continued after death.

Sea-urchins, and star-fish, and numerous fossil shells, are found in these beds, which, however, differ materially from the remains of the same animals found in the earlier formations. A vast number of new species and genera of fish are also discovered in the chalk.

Nearly all the animals and plants which existed up to this period are now extinct, although they have some imperfect representatives at the present day.

The uppermost group, which has been called the supercretaceous or tertiary formations, appears in our island to have been formed during four great eras, as we find fresh-water deposits alternating with marine ones. The terms *eocene*, which is the first or oldest deposit; *miocene*, which is the second; *pliocene*, which is the third; and the *newer pliocene*, which is the fourth and last, have been applied to these formations, the names referring to the respective proportions of existing species found among their fossil shells.

All these formations show distinct evidence of their having been deposited from still or slowly-flowing deep waters. Thus the eocene appears in the Paris basin, formed clearly at an estuary, in which are mingled some interesting fresh-water deposits; in the lacrustine formations in Auvergne; also at Aix; and in the north of Italy. It appears probable that, in the formations generally termed eocene, both fresh-water and marine deposits have been confounded, and several formations of widely different eras regarded as the result of one. We have not yet been furnished with any distinct and clear evidence to show that the deposits of the Paris basin, and those of Auvergne, are of the same age. At all events, it is sufficient for our present purpose to know that they are the result of actions which are now as general as they were when the plastic clay of Paris, and its sulphate of lime, or the London clay, were slowly deposited.

As a general conclusion, we may decide that, at the eocene period, existing continents were the sites of vast lakes, rivers, and estuaries, and were inhabited by quadrupeds, which lived upon their thickly-wooded margins. Many remains, allied to those of the hippopotamus, have been found in the subsidences of this period.

Examples of the miocene or middle tertiary era are to be found in Western France, over the whole of the great valley of Swit-

zerland, and the valley of the Danube. In these deposits we find the bones of the rhinoceros, elephant, hippopotamus, and the dinotherium, an extinct animal, possessing many very distinguishing features.

The pliocene period has been termed the age of elephants, and is more remarkable for the great mastodons and gigantic elks, with other animals not very unlike those which are contemporaneous with man.

In the superficial structure of the earth, the diluvium, alluvium, peat and vegetable soil, we have a continuation of the history of the mountains of the earth and of its inhabitants, which has been so briefly sketched. They bring us up to the period when man appeared in the world, since whose creation it is evident no very extensive change has been produced on the surface. We have viewed the phenomena of each great epoch, marked as they are by new creations of organized beings, and it would appear as if, through the whole series, from the primary rocks up to the modern alluvial deposits, a progressive improvement of the earth's surface had been effected, to fit it at last for the abode of the human race.

Thus have we preserved for us, in a natural manner, evidences which, if we read them aright, must convince us that the laws by which creation has ever been regulated are as constant and unvarying as the Eternal mind by which they were decreed. Our earth, we find, by the records preserved in the foundation-stones of her mountains, has existed through countless ages, and through them all exhibited the same active energies that prevail at the present moment. By precisely similar influences to those now in operation, have rocks been formed, which under like agencies, have been covered with vegetation, and sported over by, to us, strange varieties of animal life. Every plant that has grown upon the earliest rocks which presented their faces to the life giving sun, has had its influence on the subsequent changes of our planet. Each trilobite, each saurian, and every one of the mammalia which exist in the fossil state, have been small laboratories in which the great work of eternal change has been carried forward, and, under the compulsion of the strong laws of creation, they have been made ministers to the great end of forming a world which might be fitting for the presence of a creature endued with a spark taken from the celestial flame of intellectual life.

For a few moments we will return to a consideration of the operations at present exhibiting their phenomena, and examine what bearing they have upon our knowledge of geological formations.

During periods of immense, but unknown duration, the ocean and the dry land are seen to have changed their places. Enormous deposits, formed at the bottom of the sea, are lifted by some mechanical, probably volcanic, force above the waters, and the land, like the ocean surrounding it, teems with life. This state of things lasts for ages; but the time arrives when the ocean again floods the land, and a new state of things, over a particular district, has a beginning.

It must not be imagined that the changes that we have spoken of, as if they were the result of slow decay, and gradual deposit, were effected without occasional violent convulsions. Many of the strata which were evidently deposited at the bottom of the sea, and, of course as horizontal beds, are now found nearly vertical. We have evidence of strata of immense thickness having been subjected to forces that have twisted and contorted them in a most remarkable manner. Masses of solid rock, many thousand feet deep, are frequently bent and fractured throughout their whole extent. Mountains have been upheaved by internal force, and immense districts have suddenly sunk far below their usual level. By the expansive force of that temperature which must be required to melt basaltic and trap rocks, the whole of a superficial crust of a country has been heaved to a great height, immense fissures have been formed by the breaking of the mass, and the melted matter has been forced through the opening, and overflowed extensive districts, or volcanoes have been formed, and wide areas have been buried under the ashes ejected from them.

With the cause of these convulsions we are, at present, unacquainted.

We have evidence of the extent to which these forces may be exerted, in the catastrophes which have occurred within historical times, and which have happened even in our own day. Herculaneum and Pompeii, buried under the lava and ashes

of Vesuvius, in an hour when the inhabitants of these cities were unprepared for such a visitation,—the frightful earthquakes which have, from time to time, occurred in South America,—are evidences of the existence of hidden forces which shake the firm-set earth. Similar ravaging catastrophes may have often occurred, and, involving cataclysms, swept the surface to produce the changes we detect over every part of the earth, compared with which the earthquakes and floods of history are but trivial things. Evidence has been adduced, to show that the mountains of the Old World may have approached in height the highest of the Andes or Himalayas, and these have not been destroyed by any sudden effect, but the slow integrating action of the elements. All these phenomena are now in progress: the winds and the rains wear the faces of the exposed rock; their *debris*, mixed with decayed vegetable and animal matter, are washed off from the surface, and borne away by the rivers, to be deposited by the seas;—thus it is that the great delta of the Ganges is formed, and that a continual increase of matter is going on along the sides and at the mouths of rivers. The Amazon, the Mississippi, and other great rivers, bear into the ocean, daily, thousands of tons of matter from the surface of the earth. This is, of course, deposited at the bottom of the sea, and it must, in the process of time, alter the relative levels of the ocean and the land. Islands have been lifted by volcanic power from the bottom of the sea, and many districts in South America have been depressed by the same causes.

Changes as extensive have been, in all probability, effected by forces "equally or more powerful, but acting with less irregularity, and so distributed over time as to produce none of those interregnums of chaotic anarchy which we are apt to think (perhaps erroneously) great disfigurements of an order so beautiful and harmonious as that of nature." These forces are, without doubt, even now in action.

Had it not been for these convulsive disturbances of the surfaces, the earth would have presented an almost uniform plain, and it would have been ill adapted for the abode of man. The hills raised by the disturbances of nature, and the valleys worn by the storms of ages, minister especially to his wants, and afford him the means of enjoyment which he could not possess had the surface been otherwise formed. The "iced mountain tops," condensing the clouds which pass over them, send down healthful streams to the valleys, and supply the springs of the earth, thus securing the fertility and salubrity of lands far distant. The severities of climate are mitigated by these conditions, and both the people of the tropics and those dwelling near the poles are equally benefitted by them.

Gravitation, cohesion, chemical force, heat, and electricity must from that hypothetical time when the earth floated a cloud of nebulous vapor, in a state of gradual condensation up to the present moment, have been exercising their powers, and regulating the mutations of matter.

When the dry land was beneath the waters, and when darkness was upon the face of the deep, the same operations as those which are now in progress in the depths of the Atlantic, or in the still waters of our inland lakes, were in full activity. At length the dry land appears; and mystery of mysteries—it soon becomes redolent of life in all the forms of vegetable and animal beauty, under the aspect of the beams of a glorious sun.

Geology teaches us to regard our position upon the earth as one far in advance of all former creations. It bids us look back through the enormous vista of time, and see, shining still in the remotest distance, the light which exposes to our vision many of nature's holy wonders. The elements which now make up this strangely beautiful fabric of muscle, nerves, and bone, have passed through many ordeals, ere yet it became fashioned to hold the human soul. No grain of matter has been added to the planet, since it was weighed in a balance, and poised with other worlds. No grain of matter can be removed from it.

To be Continued.

GOLD AND ITS COMPOUNDS.

A description of gold and its uses in the arts, and its influences on society in all ages, as a symbol of wealth and an article of ornament and utility, would embrace the whole history of mankind. It was well known at the remotest periods of antiquity, and was as much esteemed then as now. At the present day it alike contributes to the comfort, convenience, and luxuries of life; as often exciting the baser passions of the human heart as promoting the cause of benevolence and virtue. By the accounts we get occasionally from California, we should judge that the effects of its abundance is to give rise to a greater amount of the former than the latter feeling.

Gold is more ductile and maleable than all the other metals, and has also the peculiarity of being of a yellow color, by which character it is distinguished from other simple metallic substances. It is found native in a state of great purity, and in combination with silver and other metals. It is generally obtained from alluvial depositions among sand in the beds of rivers, having been carried there by the waters washing it from the rocks in which it originally existed.

Pure gold is also characterized by its being free from oxidation when exposed to heat, air, or moisture. Neither is it acted on by pure acids, its solvents being chlorine, nitro-muriatic acid, and nitro-hydrobromic acid. When intensely heated by means of the blow-pipe or electricity, it burns with a greenish blue flame, and is dissipated in the form of a purple powder, which is *supposed* to be the oxide of gold.

The preparation of gold consists merely in its purification. As the subject of gold commands extra attention since the discovery of the vast quantities in California, we will here give the various methods of *assaying*.

The process is divided into five operations; *Cupellation*, *Quartation*, *Parting*, *Annealing*, *and Weighing.*

1.—*Cupellation.*—Either six or twelve grains of the alloy is the weight taken for the assay, to which is added sixteen parts of lead for every one part of copper that it is presumed to contain, though considerable more lead may be used when the sample does not contain any silver; but if the reverse be the case, an excess of lead would lead to the loss of the latter metal, which ought not to be separated until the operation of parting.

When silver is present an additional allowance of lead, equal to one-tenth of its weight, is made on that account. When, however, the quantity of silver is small, or is not required to be estimated, it becomes of little consequence what weight of lead is employed, so long as enough be used to carry off the base metals, at the same time that the quantity is not too large for the cupel.* The sample is then submitted to cupellation. This process does not require so much care for gold as for silver, as none of this metal is absorbed by the cupel, or lost by evaporation, and it will safely bear the highest heat of the furnace without injury.

The *muffle*,† with the crucibles properly arranged, being placed in the furnace,‡ the latter is filled up with charcoal, and lighted at the top by placing a few pieces, heated to whiteness, on last. When the cupels have been exposed for half an hour,

* The *cupel* is a sort of shallow crucible made of bone ashes, or burnt bones. The powder is slightly moistened with water, and a circular steel mould is filled therewith, and after being pressed down tight, is finished off with a rammer, having a convex face of polished steel, which is struck forcibly with a mallet, until the mass becomes sufficiently hard and adherent. The cupel is then carefully removed, and exposed to the air to dry, which usually takes from 14 to 21 days. The best weight for cupels is said to be 180 to 200 grains.

† The *muffle* is a pot made of clay, and furnished with an opening to admit the introduction of the cupels, and inspection of the process.

‡ An ordinary kitchen furnace will answer a very good purpose provided it is sufficiently deep to produce the proper degree of heat. It should not be less than eighteen inches deep; but two, or two and a half feet would be better.

and have become white by heat, the lead is put into them by means of tongs, and as soon as this becomes thoroughly red and circulating, as it is called, the metal to be assayed, wrapped in a small piece of paper, is added, and the fire kept up strongly until the metal enters the lead and circulates well, when the heat may be slightly diminished, and so regulated that the assay shall appear convex and ardent, while the cupel is less red—that the undulations shall circulate in all directions, and that the middle of the metal shall appear smooth, surrounded with a small circle of litharge, which is being continually absorbed by the cupel. This treatment must be continued until the metal becomes bright and shining, after which certain prismatic colors suddenly flash across the globules, and undulate and cross each other, and the metal soon after appears very brilliant and clear, and at length becomes fixed and solid. This is called the *brightening*, and shows that the separation is ended.

In conducting this process all the materials used must be accurately weighed, especially the weight of the alloy before cupellation, and the resulting button of pure metal. The difference gives the quantity of alloy.

2.—*Quartation.*—After gold has passed the cupel, it may still retain either of the perfect metals, particularly silver. To remove the latter it undergoes the operation of *quartation* and *parting*. Quartation is performed by adding three parts of silver to one of the cupellated sample, and fusing them together, by which the gold is reduced to one-fourth of the mass or even less; hence the name. In this state nitric acid will dissolve out the silver, which brings us to the next operation.

3.—*Parting.*—The alloy of gold and silver thus formed is next hammered or rolled out, into a thin strip of leaf, curled up into a spiral form, and submitted to the action of nitric acid, specific gravity 1.3, diluted with half its weight of water; this being poured off, another quantity of acid, of about 1.26, and undiluted, may be employed. In each case the acid should be boiled upon the alloy for about a quarter of an hour. In the first case the quantity of fluid should be about 2½ oz., and in the second 1½ oz.

The second part of the operation of *parting* is called the "*reprise.*" If the acid be used too strong it leaves the gold in a state of powder, otherwise the metal preserves its form throughout the process of parting. It is next carefully collected, washed and dried.

4.—*Annealing.*—The sample of pure gold has now only to be annealed, which is done by putting it into a small porous crucible, and heating it to redness in the muffle.

5.—*Weighing.*—The pure gold is next accurately weighed. This weight doubled or quadrupled, gives the number of carats fine of the alloy examined, without calculation.

The loss of weight by cupellation gives the amount of copper in sample; that after parting the amount of silver, deducting of course the weight of silver used in the process, which is called the *witness*. When the sample contains very little gold the dry method cannot be depended upon and chemical analysis must be resorted to.

Gold has the specific gravity 19.3, fuses at 32° Wedgewood's pyrometer, and has the atomic number 200.

Chloride of Gold.—Chloride of gold may be obtained by digesting thin fragments of the metal in a mixture of one part nitric and two parts muriatic acid, and evaporating the solution to dryness by a gentle heat to drive off any free acid. This is pure chloride of gold. In this case, as in most others where muriatic acid is employed, part of the oxygen of the one unites with the hydrogen of the other, and sets at liberty free chlorine, which, according to the views of Sir Humphrey Davy, is the true solvent of gold. The proportions to be used are one part of gold to two parts nitro-muriatic acid.

Thin gold leaf may be dissolved by a solution of chlorine in water.

The crystals of chloride of gold are of a red color and needle shape, or of a ruby red and prismatic shape. They are deliquescent, soluble in water, ether, and alcohol; at the heat of 400° it is decomposed. Proto-sulphate of iron, oxalic, sulphurous and phosphorus acids, and most of the metals, decompose its solution with the precipitation of metallic gold.*

Cyanide of Gold.—Add a solution of

* See vol. 2. page 275.

pure cyanide of potassium to a neutral solution of pure chloride of gold, as long as a precipitate falls, and then carefully wash and dry. The precipitate is of a yellow color, insoluble in water.

Iodide of Gold.—To a solution of terchloride of gold, add another of iodide of potassium; wash the precipitate in alcohol and dry it. It is a greenish yellow powder, soluble in dilute hot solution of iodide of potassium, from which it crystallizes on cooling in golden yellow scales. The teriodide of gold is formed when the previous process is reversed, and the ter-chloride of gold is added to a solution of iodide of potassium. It is a dark green powder, soluble in solutions of hydriodic acid, and the iodides of potassium and sodium. From the latter, dark-brownish red crystals of auroiodide of potassium are deposited by standing.

Sulphuret of Gold.—When a current of sulphuretted hydrogen is passed through a solution of gold a black precipitate falls down, which is the sulphuret. If this compound is exposed to heat it is decomposed, sulphur and metallic gold being the result.

Protoxide of Gold.—This compound is said to be formed when protochloride of gold is decomposed by a solution of pure potassa. It is of a dark green color.

Peroxide of Gold.—The peroxide of gold is formed when pure potassa is added to a solution of the perochloride; water is decomposed, the hydrogen and chlorine uniting to form muriatic acid, which combines with the potassa; the oxygen and the metal form the compound, which is precipitated with some water. This precipitate at first has a reddish yellow color, which by boiling becomes anhydrous, and then assumes a brownish black appearance. Peroxide of gold is dissolved by muriatic acid; it is also soluble in nitric and sulphuric acids; from these, however, it may be precipitated by the addition of water. It is insoluble in water; and is decomposed by heat and the action of the solar rays. The peroxide unites with potassa, baryta and other alkaline bases; forming a set of salts termed aurates; in these combinations the oxide appears to act the part of an acid.

Ethereal Solution of Gold.—This is a mixture prepared by shaking together a strong solution of the chloride of gold with an equal bulk of pure ether. The mixture separates into two parts, a lighter part swimming above, which must be decanted off immediately, and a heavier liquid remaining below. The ethereal solution should be preserved in well stoppered bottles and excluded from the light. It is employed in gilding many substances. Naptha, and the essential oils, possess the same property as ether of taking gold from its solutions.

PRIMITIVE TIMES OF HELIOGRAPHY.

IN the deeply interesting article of M. Francis Wey, published in the last number of the journal, *La Lumiere*, under this title: "Primitive times of Heliography," I read the following lines: "Wedgewood attempted, in the county of Stafford, to copy old pictures upon glass with the aid of the luminous agent, and found at the end of various trials the impossibility of succeeding! * * * The celebrated Sir Humphrey Davy, one of the luminaries of science, proceeding methodically to carry out the same idea, finally declared the enterprise absolutely chimerical. This was not merely a supposition on his part, for he demonstrated it. His decision was law, and *savants* abandoned hopes which were henceforth considered as denoting the most astonishing credulity."

There is truth in the narrative of the photographic attempts made in England at the commencement of this century, but there is also error; and as it is the duty of all conscientious men to make truth prevail over error, I take the liberty of sending you some corrections, which I doubt not M. Francis Wey will receive kindly, cheerfully and gratefully. The distinction which your writer establishes between the experiments of Wedgewood and the pretended negative demonstration of Davy, by the too hasty and disparaging judgment which he extends to the immortal chemist, moreover proves beyond a doubt that it has not been his fortune to draw from their authentic sources the fundamental details of the history of heliography. Wedgewood and Davy are not the same person, except only in the sense that Davy is the interpreter of Wedgewood, the publisher of his great idea, which places them, in a word, in the same relation as Francois Arago and Daguerre. This being admitted, allow me to translate literally the very singular and astonishing note of Davy, published in 1802. This will be one of the most valuable contributions to your journal.

The following is a description of Mr. Wedgewood's process for copying paintings upon glass, and for making silhouettes by the action of light upon nitrate of silver, published in 1802, by the illustrious chemist, Sir Humphrey Davy.

"White paper and the white skin, moistened with a solution of nitrate of silver, does not become colored when kept in darkness; but exposed to the light of day, they quickly turn gray, then brown, and finally almost black.

"These changes are more rapid in proportion to the increased intensity of light. In the direct rays of the sun two or three minutes suffice to produce a complete effect; in the shade, several hours are necessary; and the light, transmitted by different colored glasses, acts with different degrees of intensity. Thus, the red rays have little effect; the yellow and green are more efficacious; but the blue and violet have the most energetic action.

"These facts guide us to an easy process for copying the outlines and shades of paintings upon glass and procuring profiles by the action of light. When we place a white surface, covered with a nitrate of silver solution, behind a painting upon glass, and expose it to all the rays of the sun, the transmitted rays produce very marked tints of brown or black, which sensibly differ in intensity, according as they correspond to the parts of the picture which are more or less shaded; and the nitrate acquires a deeper tint at the point where the light is almost wholly transmitted. If the shadow of a figure is cast upon the surface impregnated with nitrate of silver, the part covered by it remains white, and the rest passes very promptly to the deep brown. To copy paintings upon glass it is necessary to apply the solution upon white skin. The effect is more prompt than upon paper. This tint, once produced, is more permanent, and cannot be destroyed by water or soap.

"After the profile is thus obtained it must be kept in the dark: we may expose it a few minutes to full light with impunity; and the light of lamps produces no sensible change upon the tints. We have unsuc-

cessfully attempted to prevent the part not colored from being influenced by the action of light. A thin coating of varnish did not destroy the susceptibility of this salt to receive a tint by this action, and repeated washings of the paper or skin impregnated with the nitrate did not prevent it from becoming dark upon receiving the solar rays.

"This process with other applications, we may use for making designs of all objects which have a tissue partly opaque and partly transparent. Thus, the woody fibre of leaves and the wings of insects may be represented quite accurately by this process. It is sufficient, for this purpose, that the direct rays from the sun should be transmitted, and that the shade should be received upon a prepared skin. We do not succeed so indifferently, by this process in copying the common prints; the light which passes through the part slightly shaded is too feeble to produce tints distinctly circumscribed. We have also tried, without success, to copy landscapes in the same manner, with the light of the camera-obscura; it was, however, too feeble to produce a sensible effect upon the nitrate of silver in the time usually employed for these experiments.

"Yet, it was the hope of succeeding in this attempt, particularly, which incited Mr. Wedgewood in his researches. But we may, with the aid of the solar microscope, copy the images of objects without difficulty, upon prepared paper; only, to succeed well, it is necessary to place the paper a short distance from the lens. The solution is prepared by mixing one part of nitrate of silver with six of water. In these proportions, the quantity of the salt contained in the paper or skin will be sufficient to render them susceptible to the effects of light, and without which their composition or tissue is unaltered. By comparing the effects produced by light upon the nitrate and chloride of silver, it has appeared evident that the chloride was the most susceptible, and that both were more sensitive to the action of light when damp than when dry. This point was made known a long time ago. Even in twilight, the color of a solution of chloride of silver, spread upon paper and remaining wet, passed slowly from white to a slightly violet color. The nitrate, in the same circumstances undergoes no sensible change. However, the solubility of the latter salt in water gives it an advantage over the chloride; but we may nevertheless, without difficulty, impregnate the paper or skin with a sufficient quantity of chloride, either by retaining this salt in water, or by plunging into diluted hydrochloric (muriatic) acid a paper moistened with the solution of nitrate.

"It is necessary to bear in mind that all salts which contain oxide of silver, ineffacably stain the skin, until a renewal of the epidermis. We must consequently take care that they do not come in contact with the fingers. We find it convenient to make use of a pencil or brush.

"The permanence of the tints thus produced upon paper or upon the skin, renders it probable that a part of the metallic oxide leaves its acid in order to unite with the vegetable or animal tissue, and form with it an insoluble composition. And in supposing that this takes place, it is not improbable that it finds substances which may be capable of destroying this composition by affinities, either simple or compound. We have conceived some experiments in relation to this, an account of which will be given hereafter. Nothing is wanting but a means of preventing the light parts of the design from being colored by the light of day, in order for this process to become likewise useful in execution as it is prompt and easy."

This note, we perceive, clearly solves the problem of photography. Mr. Wedgewood acknowledged the possibility of fixing images formed at the focus of the camera-obscura; he put forth every effort to attain it; but he was arrested by two great difficulties which he was unable to surmount: the light was too feeble, or the coating of silver was not sensitive enough, and he could not remove the property which his picture had of becoming dark by the action of light.

Of these formidable difficulties recognized in 1802, Wedgewood and Davy confidently foresaw the near solution, and not its impossibility, as too hastily intimated by M. Francis Wey. Thus convinced by the evidence of facts, I have thought it a duty to inscribe the name of Wedgewood in the first rank of heliographic inventors, in the same manner that I have inscribed the name of Sommering at the head of the inventors of the electric telegraph, since in

1811 he perfectly described the magnificent problem to be solved, and the first efficacious method of solution.

In the second volume of my optical Magazine, I have reviewed with impartiality, and I think with courage, the history of photography. It is fortunate for me to find my statements according, very frequently at least, with the opinions formed by your contributors; but, with your permission, I would go farther. I would render more evident still the rights of Joseph Nicephore Niepce; and, as one of the principal confidants of M. Bayard, I would make him take a rank in the history of photography which an excess of modesty has deprived him of.

L'Abbe F. Moigno.

MR. HESLER'S NEW PROCESS.—BUFFING PLATES, &c.

Galena, Ill., Jan'y. 23, 1852.

MR. H. H. SNELLING: Dear Sir.—It does seem as if I never would be able to give that promised communication. But here I am at last. I want a bound copy of Vol. 2; send it with the goods I order from Mr. Anthony. Of course I want to continue for the coming year. I am to get several new subscribers for the coming year. As soon as I hear from them I will remit to you. Has "*The Album*" been published? I am highly gratified to learn that the P. A. J. has paid so well, and trust that it will in future meet with the pecuniary benefit and encouragement it so richly merits. I would have contributed oftener than I have, but for fear of being considered too forward. I am no writer, but an ardent lover of the art, and would gladly see it rank (as it merits) *foremost* among *all arts.* It seems to me that this can never be realized until there is a more liberal spirit among some of our first artists. The conceited and illiberal disposition so manifest among most of the operators is most despicable and unworthy the noble calling they are pursuing. To this, of course, there are a few noble exceptions, but still they are too much afraid to communicate what they know, unless they can make a few dollars by the means. This is another reason why I have been more backward than I otherwise would be. In my last I omitted some things, perhaps, that I should have gone more fully into; but, it was from a desire not to take up your valuable columns with more than was actually necessary, or rather not to repeat what had already been published in other works on the art. In looking over your excellent article on the "*Difficulties of the Art*," in the October number, I was reminded of a *great* difficulty that many meet with in buffing, and of which I have never seen explained. It is this. Getting the buffs too dry and hot. A buff should always be dry, but never roasted, as I have seen some do, and then complain that their chemical was not good, or the buff would not work, or the light was bad, &c., &c. Not long since I was in a neighboring village, and of course went to the Daguerrean artist. As I entered a person was sitting. The light was clear and good as could be desired; the length of sitting two minutes. The picture when brought out, only partly developed and sunk on the plate, and appeared as if it had been only slightly acted upon by the light. After the exposition in the camera and before submitting it to the mercury, I examined his plates and found them nicely cleaned and handsomely silvered. The camera was one of Harrison's best half size. I told him to buff a clean plate, which I coated. The result was about the same. The plate was clear and clean, but apparently covered with yellowish white streaks, and clouded as if the light had got to it, or it had been overheated in the holder. I looked for the buffs, when lo! they were in a tin case on

the stove, and so hot that the sticks were almost charred! There most assuredly was the fault, and to prove which I removed the buffs from the stove, cooled, brushed them lightly, as they were already clean and in good order. In about half an hour I took a plate, buffed it, and then coated it as formerly. The light still being the same, I exposed the plate 30 seconds, and the result was a fine picture. The shadows were as clear and mellow as the light, and the whole picture stood out bold and sharp. There was a difference of 3-4 time by having the buff dry, but not hot, or even warm. Knowing that this is sufficiently explicit I now pass on to the *new picture.*

The plate is prepared and coated as usual, but instead of a dark, use a pure white back ground, so arranged as to swing either back and forth or sidewise. Then take pieces of pasteboard cut to fit inside your camera box, and in this, opposite your plate, cut an opening about half an inch smaller, and of the shape of your mat in which you wish to put your picture. Place this in front of the ground glass at a distance just sufficient to enable it to blend nicely into the picture and back ground. Now take a large sheet of pasteboard; one side white and the other colored. Cut an oblong hole in this of sufficient size (according to the size of the picture) say 6 × 8 inches for a medium or 1-4 picture, and place this between the sitter and camera, with the white side to the camera, about two-thirds the distance from the sitter. Care must be taken to arrange it so that it will blend with the figure nicely. The sitting will require to be a trifle longer, and mercurialize about one-half or three-fourth longer than usual. Now, if all is properly conducted, and the light well arranged, you have a clear black border blending into the pure pearl white on which the picture appears. This almost entirely does away with the metallic lustre of the plate, and the picture can be seen at any angle. The pasteboard in the camera may be cut into any desirable shape, and by that means give many beautiful shades and lights to the picture. The back ground should be kept in motion while the impression is being taken, and arranged with the light so as to give an ivory white to the picture.

I have been hard at work to day and evening, and now, as the small hours of night are passed away, I will close, with an earnest prayer for your prosperity and happiness. Truly yours,

Hesler.

A TREATISE ON PAPER PHOTOGRAPHS.*

BY M. BLANQUART EVRARD

Translated from the French, by J. R. Snelling, M. D.

CHAPTER X.

FIXING AND COLORING THE POSITIVE PROOF.

FIXATION.

WHEN the positive image is sufficiently revealed, we place the holder inside the camera-obscura in order to exclude the action of full light. The image is then viewed by the light of a candle, and if it does not present all the developments necessary, we again expose it to light, by replacing very perfectly the negative design upon the positive image, which is not accomplished without some difficulty.

However, we may easily simplify this operation, and regulate the power of exposure to light and removal therefrom, of the positive image as much as we wish, without compromising the design. For this purpose we stick the two faces together with gum or glue, the positive paper upon the negative proof, and consequently obtain almost infallibly an exact superposition of the two images, the negative not being liable to become displaced.

When the positive image becomes perfect, it is yet to be fixed, that is to say, rendered unalterable by light.

This result is obtained by depriving the proof of the salts of silver upon which the light has not acted, and which forms the white parts of the proof.

We therefore commence by washing the proof, which is done by soaking it in a large vessel filled with rain or river water. When we have recourse to spring water, we must satisfy ourselves before using it, that it contains none of the salts of iron.

When there is no hurry, we always find it advisable to leave the proofs all of one night in this bath. It is necessary to introduce all the proofs one by one, but at the same time; for, if we allow much time to elapse between the introduction of each, the proofs first put in, having rendered the bath turbid, would have the effect of spotting those which are afterwards introduced.

This bath cannot be used twice. It will be essential, therefore, to renew the water for each immersion of a fresh series of proofs.

The salts of silver cleared from the proofs are generally precipitated when the water which is generally used, is not completely pure; the high price of distilled water and the quantity that is consumed for this operation, rendering it impossible to appreciate the advantage of its use.

The reddish precipitate which is formed, deeply spots the papers, and consequently the images, if they come in contact with the air before being cleansed. This accident is still more to be feared, if the proofs are placed, covered with these precipitates in the hyposulphite bath; it is therefore prudent, not only to introduce the proofs one by one in the water, but not to let them swim upon the surface, which we prevent by laying a piece of glass upon the last proof, in order to keep the whole at the bottom of the vessel; only it is necessary to take care that the face of the design is turned down, so that there may be no deposit except upon the back of the images.

When the proofs are removed from the water to be submitted to the hyposulphite, they must be withdrawn one by one from the bath, taking care to shake them briskly under the water, in order to free them from the precipitates, which never should come in contact with the air nor that of the chemical baths.

Some authors have advised us not to have recourse to baths of water, when the

proofs were too feeble, but to submit them immediately to the action of the hyposulphite, in order not to weaken them still more; but, following this advice, we produced a contrary result, and weakened the proofs beyond measure.

Water has no action on the salts of silver which the light has reduced, and which forms the image, while it dissolves the salts of silver which light has not affected; whence it results that a proof which has been submitted to water requires an immersion of shorter duration in the hyposulphite, than another proof which has not been washed, for the simple reason that in the latter case it has a larger quantity of the salt of silver to dissolve; and as the hyposulphite often dissolves even the salts of the image, when this image is slightly marked, it follows that the image will be more weakened by the bath, if we still farther prolong its immersion.

What we call fixing the proof, is not therefore a new property which is given to the image formed by light, but simply an elimination of all the chemical elements which have contributed to its formation. All the reagents which are capable of acting by means of decomposition, upon chloride of silver suspended in the positive paper, will consequently fix the proof, if they have not a destructive action upon the blackened salts which form the image.

The hyposulphite of soda which has been described by Mr. Talbot, the inventor of photography on paper, is still the reagent which produces the best effect, its action being more energetic upon the salts not reduced than upon those which form the image. Upon withdrawing them from the bath of water, we plunge the proofs—shaking them gently for nearly a minute—in the following solution:

1 part hyposulphite of soda.

8 parts rain water, or from the river in preference to spring water.

At the end of a few hours the salts of silver of the proof are dissolved, and we observe that the paper acquires a transparence.

The hyposulphite attacks all parts of the proof. The brown tone which the image previously had, passes in a few moments to the reddish shade, and the luminous parts are brightened, but the shades are in the same state of discoloration.

If we prolong the action, the discoloration becomes too considerable. The proof acquires more brilliancy, it is true, in the lights, but it acquires a uniform tone in the colored parts. The tone on the background being of the same coloration as the shades, it follows that the image wants depth of tone and loses a part of the charm which characterizes designs with proper gradations of light and shade. The proof upon being withdrawn from the hyposulphite should be submitted anew to the bath of water. The immersion must be prolonged for two or three hours, so that the water can be renewed several times. When not too much prolonged the immersion ought to last at least a day.

Upon withdrawing the proof from the bath we wash it with very clear water, and dry it between two sheets of blotting paper; we may also dry it by hanging it up with a thread before a fire-place. According to M. Guillot-Sagez, this method would be preferable to the former, it giving more brilliancy and greater permanency to the proof.

CHEMICAL COLORATION OF THE POSITIVE PROOF.

We have seen, that in passing the positive proof into the hyposulphite bath, it was colored in a uniform manner. We have also seen that the property of the hyposulphite was not limited to removing from the paper the salts of silver, which were darkened by light, but it likewise spreads over all parts of the image which it invariably weakens.

We come now to give the means for fixing the proof and yet modifying almost infinitely its coloration and appearance—strengthening the shade, giving due brilliancy to the lights; finally, effecting gradations and fineness of tone, which the hyposulphite in its simple state could not produce.

The principal result which we have obtained in searching for these means, is the coloring of shades black, by the addition to the hyposulphite of some crystals of nitrate of silver.

By seeking for the reason of this effect, we have discovered that it was not due to the presence of silver in the bath, but to its change of state. By the decomposition of nitrate of silver, the bath passes to the

acid state, the silver is precipitated, and the decanted liquid does not disclose upon analysis the slightest quantity of silver.

It is consequently because the bath becomes acid, that it acquires the valuable property of darkening the shades of the image, and of strengthening them at the same time that it gives more brilliancy to the lights.

There is, nevertheless, this difference between a bath acidulated directly, and the bath rendered acid by the addition of nitrate of silver, as the latter more or less colors the paper yellow, according to the strength of the bath or the length of time that the proof remains therein, an effect which could not be produced with the new baths of which we shall speak hereafter.

All acids are not equally suitable for this purpose. The nitric, muriatic and sulphuric acids, would destroy the image in a very short time, if the bath contain a little too much.

Acetic acid, on the contrary, unites to a remarkable degree every desirable quality. Its use is attended with no danger.

Thus are we in possession of two methods for coloring proofs black, with this difference; that the former gives the paper a yellowish tinge, favorable to certain effects; this tint having some analogy to that of engravings upon China paper; the other, on the contrary, preserving the paper in all its brilliancy and whiteness, does not attain the black color except by passing first through the violet shades with a very agreeable effect.

If, instead of acidulating the hyposulphite bath, we render it alkaline by the addition of several drops of ammonia, a directly opposite effect is obtained; that is to say, instead of becoming black, the shades of the design would redden, and pass to a warm tone (Roman sepia), with quite an agreeable effect, much less complete than that of acidulated baths, but infinitely more satisfactory than that of the hyposulphite alone.

From these variations in the effects which we obtain according to the state of the bath, it results that three different baths are necessary for the treatment of proofs according to the effects which we desire to obtain.

These three baths consist of a solution of:

1 part hyposulphite of soda,
5 or 6 parts of water.

The first bath left in the simple state, without the addition of either acid or alkali, may receive, without distinction, in two minutes or less, all proofs which have been suffered to soak at least twelve hours in water.

The second bath of hyposulphite may be rendered alkaline by means of a few drops of ammonia, the presence of which may be shown by its restoring the blue color of litmus paper which has been reddened by an acid.

Finally the third bath is acidulated with acetic acid, which we also ascertain by means of the blue litmus paper.

To facilitate explanations, we will call the first bath the neutral, the second the alkaline, and the third, the acid bath.

To these three baths we may add a series of others, composed of the same elements, but more concentrated, or more diluted; more recently combined, or older; we know, indeed, that old solutions produce certain very valuable and remarkable effects; also that we should keep each bath in separate vessels.

Supposing now that we have produced a dozen positive proofs by means of the same negative, and all the dozen very uniformly impressed with the same degree of coloration by the action of light; if we submit these twelve proofs to the acidulated baths, but at different periods, we will have twelve results absolutely different as to tint and effect.

Admitting that these baths have been formed in the same manner; the most active, that which will have the greatest coloring action, will be the oldest—the longest in use.

It is not only by its activity that this bath is distinguished from others, but frequently by the particular tones which it imparts to the proofs. These tones have a softness and a delicacy, which the more recent baths are incapable of giving; in return, the latter admit of a boldness and energy of tint, which could not be produced by the old baths.

With a little taste and observation, the employment of these baths allows us to secure to the proof effects which there is certainly no doubt are those which are limited to the hyposulphite.

The old acidulated baths in particular, induce extremely fine tones.

The first effect of old baths upon the proofs, is to give vigor of tint. The subsequent effect is to weaken it, and thus certain designs arrive at softness of shade with an infinite charm. If we prolong the action beyond this limit, the paper acquires a yellowish tint, like that described in the use of baths acidulated with nitrate of silver.

This bath is the finest of which we have occasion to speak. It preserves the white parts better, and the proof has the appearance of a design produced with a black and white pencil upon a colored paper.

Instead of leaving a proof to the action of a bath only, we may render the particular properties of each of them useful in improving the general effect; thus when a proof becomes too energetic in the acid baths, the neutral baths which have a more destructive action upon the image, may be employed with advantage.

If the shades of the proof are too dim when we withdraw them from the alkaline baths, we may give them a more lively tone by putting them in an acid bath; so also a proof that is cold, submitted to the acid bath, may be revived by means of the alkaline bath.

These baths are in photography what the lampblack in painting, is to the oil. In one as in the other case, the method is not alone sufficient for success, but observation and practice are requisite in order to act seasonably and with the most suitable circumspection.

It is never necessary to pass a proof from the alkaline to the acid bath, or from the latter to the alkaline bath, without previously rendering it neutral, which is done by first washing it freely with water and by plunging it for a minute or two in the bath of neutral hyposulphite. Without this precaution, we would not only fail to obtain the desired effect, but we would change the particular properties of each bath.

By adding to the hyposulphite bath a few crystals of acetate of lead, we give the proofs a red and a violet shade.

The red shade is the first effect, and the violet the second.

We have observed that this effect to be complete must be produced from the commencement of the coloration of the proof. It is necessary therefore, for obtaining it, to place the proof in the bath of acetate of lead after withdrawing it from the water and the neutral hyposulphite bath; if it were further passed through the acid or alkaline baths, the shade would not be sharper.

When we wish to secure for the proof the particular shade imparted to it by acetate of lead, it is necessary to avoid submitting it to particular baths; but when we have no occasion to obtain this tint, we may have recourse to the acid baths, as they impart a deep violet appearance which is more agreeable. We should make use of the acid baths when the proof has a generally too uniform tint.

It results from the foregoing, that we can at pleasure give a determined coloration to positive proofs. This is absolutely the case, however, when the proofs are strongly colored; we might almost compare what takes place in the acidulated hyposulphite bath, to a struggle which is carried on between the destructive action of the hyposulphite upon the image, and the action of the image in the bath to seize upon its coloring property. If the bath overcomes the proof, and this occurs when it is withdrawn too feeble from the camera, it is gradually revealed, and although developed, its shade may be much modified, but we cannot give it vigor. If on the contrary the proof is vigorous, it overcomes the destructive action of the bath and increases the coloration; but, (and it is an admirable effect in an artistic point of view) all parts of the image do not present the same resistance to the destructive action. This action, ineffectual in changing the powerful parts, overcomes the parts which are feeble and discolors them; a valuable result, since it has the happy effect of strengthening the shades and giving more brilliancy to the lights.

This is certainly the most attractive study in photography. We merely lay down the first principles of this new and very charming method, and which affords to enterprising amateurs a wide field for useful observation.

The time is not far distant when photographic designs will be true artistical productions, for they will no longer be the

ignorant work of a mere practical manipulation, but the combined product of experience and taste.

It is easy to judge the difference that exists between two proofs, one of which has been subjected to the simple bath of hyposulphite, and the other to the baths with double action.

When it is our intention to employ these last baths, it is necessary to give the proofs much vigor, by a prolonged exposition in the camera.

Suppose, for instance, that two designs have attained the same degree of coloration after having been fixed, but in which one is scarcely revealed when removed from the camera after exposition, and the other, on the contrary, very powerful.

To reduce the latter to the coloration of the former, we must deliver it to the energetic action of the hyposulphite, by which means the demi-tints of the design acquire as much delicacy and softness as that of the first possesses roughness and harshness. Upon one the demi-tints are nothing more than the blending of light and shade, while upon the other, the demi-tints are the shades weakened, and consequently the shades of the coating are formed with a finer color.

It is essential to know, indeed, that wherever the paper is impressed by light, the hyposulphite permits a coloration to exist.

We ought particularly to obtain with this effect, by means of negatives on paper, positive proofs in which the grain of the paper has completely disappeared, and which rival the most beautiful proofs upon glass, not only as to detail and delicacy of outline, but in attractiveness, harmony and beauty of appearance.

Here terminates what might be called the rudimentary or classic part of photography on paper, and which yields the image by direct and regular chemical reactions; it now remains for us to speak of the means which can be employed for modifying methodical results, by weakening or strengthening them, and thus effecting a more agreeable or more complete result, according to the exigences of the art, or the tastes of the operator.

CHAPTER XI.

ARTIFICES FOR GIVING MORE VARIETY AND PERFECTION TO PROOFS.

We have seen in the preceeding chapters, that the ability of the operator consists in drawing the best advantage possible from the elements at his disposal and of the circumstances in which he is placed. These elements are the reagents which serve for the operations: when made to act upon each other they obey the laws of chemical affinity, that is to say they undergo partial modifications; we will perceive, however, in what measure these modifications may be turned to the profit of the proofs.

METHOD FOR STRENGTHENING THE COLOR OF NEGATIVE PROOFS.

After a negative proof is submitted to gallic acid, it is very frequently withdrawn before the black parts of the proof have attained the degree of intensity which would give the design its full brilliancy. We follow with the eye, so to speak, the action of gallic acid in the bath; and when the proof is perfectly successful, we always fear that it will become spoiled by being left too long in the bath, consequently we are liable to withdraw it too soon, and before the acid has produced its full action. We are often deceived as to the propriety of prolonging this action, if, instead of always viewing the transparence of a negative proof by holding it up to the light, we content ourselves with examining its surface. A negative that appears fine at first sight, does not generally admit of more than indifferent designs: while another negative which we might be induced to think inferior to the first, because the tones are less sharp and more dim, furnishes admirable positives. We may compare the merits of these differences by viewing the transparency of the two negatives by the light of a lamp or candle: in the former, the design is transferred only superficially, and the passage from light to shade is made without transition, while in the latter, the chemical reagents having penetrated the paper, the gradations of light are continued and less glaring.

We should always examine the transparency of negative proofs. Under these

circumstances alone can we obtain reliable instructions as to the true effect which the reagents have produced.

It is because we do not follow this precept, that the negatives are almost always too feeble. This fault is the more frequent from the fact, that it is almost impossible, when a negative has been obtained with a soft light, to give it, with one bath only, all the coloration which would be necessary in order to obtain afterwards satisfactory positive proofs. The deficiency of coloring in the negatives is one of the most frequent causes of failure.

Fortunately, a too feeble negative proof is not irremediable; and we come now to speak of the means for giving it, afterwards, more coloration and vigor, even after having transferred a large number of positive proofs.

To undergo this new treatment, the negative ought to be waxed. This being done, we soak the proof in *crystallizable* acetic acid. Under the influence of this acid, the paper becomes as tough as parchment, and, moreover, it acquires the same degree of transparence as oil paper. If, perchance, the transparence were not uniform over the whole surface of the negative, it would be necessary to wash it freely with water, and pass it to the bromide, as we would for fixing it; then dry it again, and soak it a second time in acetic acid.

When the negative has acquired the transparence of which we speak, put it to soak in a bath saturated with gallic acid, to which add a few grains of nitrate or aceto-nitrate of silver.

Care must be taken in the course of this operation, to agitate the bath, so as to dissolve all the acetic acid which is at the surface of the paper. After a few moments of immersion in the bath, the colored parts of the negative pass to a deep black; but it happens at the same time that the design is disguised, and totally disappears under a uniform black coating, which seems to extend to the back of the negative.

This new negative which we might be led to suppose was spoiled, has acquired an unexpected value, for, if we examine it by the light of a candle, we discover that this dark coloration has not altered the transparence of the paper in the clear parts, and that the black parts alone have been colored.

We had proposed, to strengthen in this manner the too feeble proofs, by means of gallic acid; but it almost always happens, when we have recourse to this means, without first soaking the proof in acetic acid, that the whole surface of the paper is colored, and that the proof completely loses its transparence: the same effect is produced also, notwithstanding the use of acetic acid, when the negative proof has been waxed. So, as we remarked in commencing, although the gallic acid produces good results, the negative must not be waxed, and before being placed in contact with this acid, it may be submitted to acetic acid.

When we withdraw the negative from the gallic acid bath, we wash it freely with water, and plunge it in a solution of hyposulphite of soda, acidulated with a few drops of acetic acid.

We may use without inconvenience, for this purpose, a fresh solution of hyposulphite. Under the influence of this solution, the whites of the negative reappear with their primitive brilliancy, and the blacks maintain all their intensity.

It is necessary to frequently agitate the negative in the bath before withdrawing it, in order that the action of the hyposulphite may not be localized upon the surface of the negative. It is, for the same reason, an advantage to plunge only one negative at a time in the hyposulphite solution.

When we can thus watch the action of the hyposulphite, we may resort without difficulty to very concentrated solutions. But when we are obliged to leave the operation to itself, dilute baths must very necessarily be employed, and every bath must contain only one negative at a time.

We know that the action of the hyposulphite has been pushed far enough when the white parts have acquired all their freshness and transparence. Upon withdrawing it from the hyposulphite bath, the negative is washed freely with water, and waxed as usual.

We have already said, and we still repeat it, that in order to have a satisfactory positive proof, it is necessary to give as much transparence as possible to the paper of the negative proof, and, in this respect, the use of the wax is fully equal to the emergency. But before using it, we must

be sure that the negative has all the qualities of requisite shade, for, after it is once waxed, it is impossible to submit it to any new treatment for coloring it.

MEANS FOR STRENGTHENING NEGATIVE PROOFS ON GLASS WHICH ARE TOO FEEBLE.

Proofs on glass have no need of being submitted to acetic acid, like proofs on paper; the acetic acid will even have in this case a troublesome influence; it would exercise a corrosive action upon the albumen, dry it up, and make it peel off. To strengthen a proof on glass, it suffices to plunge it in a saturated solution of gallic acid. We accelerate the action of the bath, by heating it slightly, or by adding a drop or two of aceto nitrate of silver. But, this method must not be used except with extreme caution.

It must be remembered also, that the negative image on glass is, in reality, more powerful than it appears, when viewed in the bath; and as it is always easy to strengthen a too feeble negative by a fresh immersion in gallic acid, whatever may be otherwise the number of immersions to which it has already been submitted, there is a true advantage to proceed with care, and to reserve the power of completing the action of a treatment which might have been insufficient, to a fresh treatment.

Upon removing it from the bath, we wash the negative freely with water, and put it in a chamber to dry where the temperature is not too high and the atmosphere too dry. There is never any difficulty in drying the proof in a place a little damp. The slower dessication is effected the greater are the chances for the negative to keep a long time without altering.

From the general facts which we come to expose, there results some consequences of the highest importance, and upon which we deem it a duty to dwell for a moment

Since by means of gallic acid, properly employed, we can strengthen as much as we wish the dark parts of a negative proof, it is very evident that we may dispense with a vivid light for producing deep tones; and here photography on paper has more resources than photography on plate, because the intensity of the lights in a proof upon plate is proportionate to the intensity of the light which produces the impression, and which the mercurial vapors render apparent, while in photography on paper, vivid lights, feebly delineated, in consequence of the shortness of exposition, are developed, with full strength and beauty, by means of repeated immersions in gallic acid.

By increasing a too feeble luminous action by successive baths, we avoid the solarization of the proofs, which is almost always produced when the exposition has been too much prolonged, or when we operate with a too vivid light.

On the other hand, if the gallic acid is suffered to act too long upon a negative proof, this proof is infallibly useless or injured when removed from the camera, for then the action of gallic acid extends to the whites of the negative, which it alters. Now, this effect is not produced when the proof has been submitted carefully, first to gallic acid, and then washed with acetic acid, to be again submitted to gallic acid. There is consequently an advantage in employing the gallic acid in successive baths, in connection with acetic acid.

METHOD FOR DISCOLORING NEGATIVE PROOFS ON PAPER.

We have seen that a too feeble negative, on paper or glass, may be strengthened; we now come to speak of a contrary problem, and treat of the method for weakening a negative which is too much colored. This last operation is more delicate than the first, because it is necessary to preserve the negative in all its harmony, and to weaken the tone of the lights and shades, without changing their relative connections.

Cyanide of potassium, and the energetic mineral acids, as hydrochloric and nitric acid, cannot be employed for this purpose. Their action is too energetic upon the demi-tints of the design.

To judge whether a negative is too much colored, we must not content ourselves with examining the surface; it is necessary to view its transparence, for the coloration of a negative not only results from the intensity of shade of the colored parts, but also from the more or less opacity of these parts and the resistance which they present to light, when with their aid we draw the positive proofs.

It results that to diminish the colora-

tion of a proof, we may have recourse to two ways.

The first consists in rendering the darks more transparent, and the second in weakening them. In certain cases we may even combine these methods with advantage. The use of one is not a reason for excluding the use of the other.

When the negative colors a positive proof on paper too much, we increase its transparence by means of wax, and when it is on glass, by means of a coating of varnish. If this means is insufficient, we may have recourse to a bath of hyposulphite, especially if the negative has been fixed with the bromide of potassium.

We may also have recourse to bromide of iodine.

Into a large deep basin, half full of water, we pour a few drops of bromide of iodine saturated with bromine, and then shake it. The liquid should be scarcely colored. If it acquires a yellow tinge, too much bromide of iodine has been added, and it will be necessary to dilute the liquid with a fresh supply of water.

We can ascertain when the liquid has attained a proper concentration, by soaking in it a strip of ordinary paper. This paper ought to acquire, in drying, a lilac tint.

We plunge into the bath the negative proof which is to be weakened; this proof, however, should be first waxed by means of a piece of paper a little stiff; it is necessary thus to prevent, with the greatest care, the formation of air bubbles at the surface of the paper.

After a while, the negative takes a lilac tint, then violet, and finally blue. When the negative has acquired the latter shade, we plunge it into an acidulated solution of hyposulphite of soda. The proof is discolored in this fresh bath: it becomes as much clearer in proportion as its shade in the bromide of iodine was deepened. At the moment when the paper has acquired its requisite transparence, we wash the negative freely with water, and let it remain a few hours in a basin filled with water, which we renew from time to time.

When the negative has been deprived of all its hyposulphite, we hang it up by one of the corners, to a cord which has been appropriately placed for the purpose, or dry it between several folds of blotting paper.

It is impossible for us to give more minute directions as to the time the negative proof should remain in the different baths. The action which must be produced, depends upon the degree of coloration for each negative. It sometimes happens that the duration of immersion should be different. Fortunately all these operations are accomplished, without interruption under the eyes of the operator, and with a little attention it is easy to ascertain the moment when it is necessary to withdraw the negatives, and to pass them from one bath to another.

With bromide of iodine, as with hyposulphite of soda, it is advantageous to proceed with care. If after one bath, the negative is not sufficiently discolored, there is no reason why it should not be submitted to the action of a fresh bath.

METHOD FOR DISCOLORING PROOFS ON GLASS, AND FOR ALTERING THEIR PRIMITIVE CHARACTER.

The process which we have described, for discoloring negatives on paper, does not apply to the negatives on glass. When we discolor a negative on paper, we weaken not only the darks of the design, but we increase the transparence of the white parts. With proofs on glass, the process reduces itself to the discoloration of the darks, for the light parts formed by an albuminous coating, which is perfectly transparent, does not undergo any change.

In the majority of cases, it will be found well to employ the hyposulphite bath very concentrated, and then let the proof soak for two or three hours. Most frequently, this treatment will answer for properly discoloring a proof which is too deep.

The proofs on glass do not require any different kind of treatment from those of which we have just spoken, and by means of which we may impart to them a charm and an infinite variety of tones.

When we have acquired by a little practice, a proper manner of using the brush, we may pass a thin coat of bromide of iodine dissolved in water, over the dark parts in order to weaken them. We may then color the light parts, by means of an additional solution of gallic acid with a drop or two of aceto nitrate of silver, which we also apply with a brush; and when under the influence of these two solutions com-

bined, which discolor the parts which are too dark, and strengthen the parts which are too light, we check the action of the reagents by plunging the proof in a bath of hyposulphite of soda not acidulated.

We can likewise diminish the vigor of the negative proofs on glass, by means of a coat of fine table varnish carefully spread upon the surface of the proof.

Before drawing the positive proofs, it is necessary to see that the varnish is perfectly dry, for which result, at least twenty-four hours is required. A negative upon glass, which has been varnished, can no more be submitted to these renewed treatments. It is rendered similar to a proof upon paper which has been submitted to wax.

METHOD FOR CLEANING THE BACKS OF NEGATIVE PROOFS ON PAPER.

The spots which are produced on the backs of the negative proofs, are owing to an endless number of causes, which it is not always easy to avoid. The impurity of the paper upon which we operate, the impurity of the lining papers which are in contact with the back of the negative in the course of the operations, the neglect of a little care, the action of a feeble ray of light, an incomplete washing after the fixation of the proof, are all sufficient to compromise irreproachable negatives in every respect.

These accidents, which are of daily occurrence, are the dangers which the zeal and inexperience of beginners have to encounter.

However, nothing is easier than to wash off a negative, and to restore its full value, if it has lost it by an accident of this kind.

After having waxed the negative by the ordinary process, make an application to the back of a concentrated solution of bromide of iodine. If, independently of a few large spots, there are found some which are smaller and deeper, as produced when the paper contains metallic particles, it would be necessary to wet these last spots with a brush dipped in the same solution of bromide of iodine. Care must be taken that the application does not extend beyond the limits of the spot, otherwise, in place of a dark spot a white one would be produced.

When the small deeper spots have been thus attacked, lay the back of the proof upon a bath of bromide of iodine, sufficiently concentrated to tinge the water a slight golden yellow color. Care must be taken to remove the bubbles of air which form at the surface of the negative. The time of contact differs according to the intensity, number and nature of the spots.

It is impossible to give definite instruction in this respect. Experience alone should serve to guide the operator. Moreover, there is always an advantage in proceeding slowly and with circumspection, for, if the spots have resisted the first bath, nothing prevents it from being submitted to a second and third.

It is necessary to take care that the bath of bromide of iodine does not wet the surface of the negative, because the image would be attacked.

When the bromide of iodine has produced its disaction, plunge the proof in a hyposulphite bath, wash it freely with water, and dry it according to the customary method.

Care must also be taken, when you cleanse a proof, not to introduce the hyposulphite in the bath of bromide of iodine, for these two compounds are decomposed as soon as they are placed in contact. For the same reason, it is necessary to avoid touching the proof when the fingers are wet with the hyposulphite solution, since the least trace of hyposulphite would prevent the action of the bromide of iodine.

METHOD FOR TAKING POWERFUL POSITIVE PROOFS WITH VERY WEAK NEGATIVES.

When negative proofs have been submitted to wax, it is impossible to reanimate the general tone of the design, by means of gallic acid; in this instance we have recourse to the following process for taking powerful positives.

Place the negative proof on the positive proof, and cover it (the negative) with several sheets of very fine paper. By means of this superposition the contrasts are exaggerated in an incredible degree. But it is indispensable that the exposition should take place in the sun. By varying the number of sheets of paper, and by employing them without preparation, or after

having submitted them to the wax, the proofs may be varied almost *ad infinitum.*

In order to make ourselves understood, we will give an example.

The positive proofs are varied, without changing the negative in the slightest degree. To accomplish this, the operator should proceed in the following manner.

1. He may first obtain the positives in the usual way, without moving the negative, this is then the first type.

2. He may increase the effects of contrast, for imparting more brilliancy to the lights and more vigor to the shades, by the superposition of a certain number of sheets of fine paper upon the negative proof.

3. The effects which this addition produces, may be varied, by waxing or not waxing the paper which is placed over the negative proof.

4. To explain still more clearly, if possible, we will suppose that it is a landscape which is taken, and that the negative proof of this landscape wants coloration, and that the sky has a dim tone, and that we wish to brighten it; we cover the sky with paper not waxed. This simple change is sufficient to impart to the sky a warmer general tone, and more strength to the outline.

Note by the Translator.—The paragraph of M. Evrard s Treatise, on page 104 of this volume, commencing with these words; "*A similar phenomena, etc.,*" and also the two paragraphs immediately following, are the continuation of the note at the bottom of the page.

ART-UNIONS.

BY J. K. FISHER.

THE American Art-Union during the last three years, has been the subject of much sharp discussion, both in conversation and in the journals. The result at the commencement was such as to induce the managers to say, in their Bulletin, that the opposition did them good, and that some had even suspected them of prompting it themselves. We do not profess to have read the earlier effusions; but, as the subscription in '49—the year in which this opposition assumed a firm and energetic character—was greatly in advance of that of the previous year, it is not improbable that the opposition, then carried on by a few, may have excited an earnest defence, and thus aided the committee in their efforts to gain attention and money.

But the next years' result was such as to disabuse all reasonable minds, and even the minds of the managers, of the notion that their opponents were believed to be, what they slanderously asserted them to be, men of neither talent nor public spirit. The public confidence was lost, or at least suspended, to such an extent that the number of subscribers was twenty-six hundred and fifty less than in '49. The past year, notwithstanding the strenous efforts of the managers to recover their lost ground, has still further proved that they do not give satisfaction; even at the last day of the year, more than a week after the constitutional time of their drawing, which overrun time had been used with all assiduity by putting subscription papers in the fashionable bookstores, and appealing through the press to the friends of the institution—even after all these extraordinary exertions the number of subscribers was 3926 less than in '50, and 6576 less than in '49.

Various excuses have been put forth, in the Courier and Enquirer, and in the Herald, by the managers: they said that in '50, Jenny Lind, and in '51, Kossuth, diverted attention and money from them. But in '49 the International Art-Union re-

ceived $28,000 from the friends of art, and yet they *in*creased about 1500 subscribers. The excuse is, if sincere, a mere guess: but it is probably a mere flourish of words, without regard to their truth, but solely with the design to produce an immediate effect. This doubt of their veracity is founded upon the fact that down to a late period they asserted that they had an immense gain over last year, and upon the ridiculous pretences they have published in their advertisements, that the value of their prints is four times the amount of their total income, the value of their Bulletin more than their total income, the benefits of their gallery more than their total income, and the prizes distributed are the best works the country can produce. And besides these grounds of distrust, I may mention that they have twice been flatly contradicted by me, and have neither proved their assertion nor retracted them, that I am aware of. One of these contradictions was upon this point; I had asked, in the Herald, why they had not published last year their usual Annual Report of transactions; they replied that they had done so in the Bulletin for January '51. Now a mere account of the drawing and speeches, with the reports of committees, such as might have been published in the Bulletin, as it was in several newspapers, would not have been the annual report of transactions: this report contains a complete list of all the subscribers, arranged alphabetically, and divided into states and towns. But I called at their gallery, and asked for the Bulletin for January, '51; and was told by the clerk that no Bulletin was published in that month, nor until April. This impudent attempt to gain a few subscribers, by publishing this reflection upon my veracity, was made on the 30th of Dec., the day before the postponed drawing was to take place. Of course it was probable that my contradiction would not appear in time to spoil the effect of it.

The Annual Report of Transactions has, in conformity with the customs of Art-Unions, been regularly published until the past year. By comparing the reports of different years, the Committee of Artists, appointed in '50 to examine and report upon the affairs of the Art-Union, found that two-thirds of the subscribers fell off at the end of the year; and that the great bulk of the subscribers of the next year were new, and probably ignorant of the management, and the poor quality of the prints, Bulletin, pictures, and other matters which they were to receive. Such was the effect of this exposure that they determined not to afford means to show a still greater falling off:—two-thirds fell off in a year in which they *gained* 2606; how many must have fallen off in the next year, in which they lost 1850. To veil as much as possible this evidence of dissatisfaction, they have during the past year published merely the *names* of their subscribers; formerly both names and *residences* were published in their Bulletins. This secresy, and the means taken to prevent the public from being led to notice it, is a symptom of rottenness verging upon dissolution.

After this accumulated evidence that the management does not give permanent satisfaction, I think I may put the question whether the plan they adhere to is deemed bad, or the men themselves are deemed incompetent to carry it properly into effect! I think the former reason is the more operative; but my opinion, and that of the public, may differ upon this point. I do not find that any good systems of government, or good measures, are much opposed because of the acknowledged faults and incapability of the men who originated them, and carry them on; and this liberal allowance is made in favor of the Art-Union, by many of my acquaintances who fully agree with me that its managers are deficient in all the qualities required in those who direct the affairs of a liberal art, and influence the public taste. It is true that the Artists' Association, got up by artists who are disgusted with the Art-Union, adopted the view that the plan was good, except as to the publishing part of it; but the men were unfit: and they, with the same plan of purchasing for the prize-drawer, would produce a highly beneficial effect. Although—I am sorry for it—I helped to organize this association—I have on all proper occasions declared that it will not give satisfaction, nor promote true art: it may be less odious to artists, inasmuch as it will not insult and exterminate them; but no organization is fit to dictate to the man of taste what work he shall hang upon his wall, or the man of genius what style of subject he shall *adopt*—not originate.

The true principle is this: the man of genius is above any commitee, and it is profanation to place a committee between him and the man of taste, for whom he was sent, and from whom only he can hope for appreciation and support. Mediocrity is the highest probable condition of any artistic body, whether that body be founded on the aristocratic principle, like the National Academy, or on the democratic principle, like the Artists' Association; and that these mediocre councils and committees should attempt to govern the few who may have most claim to be regarded as men of genius, is an audacious presumption that shows not merely a lack of judgment and breeding, but also a lamentable want of principle. No thoroughly *honest* man, much less a liberal man, can possibly implicate himself in such an abominable usurpation of authority.

In defence of this usurpation, retained by tricks, the Art-Union and the association say: the people know nothing of art; they are not fit to be trusted to choose for themselves; they would waste the funds upon daubers; they would employ only the most distinguished artists, and leave the rest to starve; they would not nurture the rising genius; they would not see that each in his turn should sell a work; and other words in abundance, fired off like shot, merely to beat down the opposition, without the slightest regard for truth, or the interest of art, or the public good.

With almost equal truth it may be said, the Art-Union managers and even the corporations of artists, know nothing of art; they are not fit to choose for themselves, much less for others; they waste funds upon daubers; they publish journals, and influence other journals by their patronage, to confer reputation upon daubers who cringe to them, and to censure and slander artists of merit who will not submit to their dominion; they do not purchase of the youthful genius until he can paint something worth fifty dollars; they do not purchase works at liberal prices; they are as obstructive to the progress of art and taste as European despotisms and oligarchies are to the progress of political economy and national wealth, and as the usury laws are to the healthy state of the money-market.

The sooner all governments learn to manage public affairs, and let alone private affairs, the better. We want no censorship of books and newspapers, &c.; no interference of government with religion; no corporations with power to confer reputation; no men weilding the power of a multitude to stand between Horace and Macaeras, or Leslie and Lord Egremont.

In one point all Art-Unions agree—that the lottery principle is good. It is said by some that it is illegal. The Art-Union affirms that it is illegal for others; but legal for itself, because, although its charter contains not a word to authorise it, yet when that charter was awarded, the Legislature knew that it annually distributed works of art by lot. It also affirms that to distribute certificates available for the purchase of works of art, or any other objects whatever, would be a violation of the statute. This nice distinction, whose only difference is, that in the one case the prize drawer chooses a work that he wants, and in the other a domineering committee foists upon him one that he does not want, in many cases, and does not prefer in any case—this very acute distinction shows the utter deadness to truth which these cavilling sophists have manifested in all their controversies for the last three years. Any disposal of pictures by lot is a lottery; and the real question is, whether the statute enacted before these lotteries came into use, was intended to prevent any useful application of the lottery principle that might be discovered. I have been told by some lawyers that the statute would be held, by the courts, to prohibit the lotteries; by others, I have been told that it would be ruled, that the law does not expressly cover them; that the law aimed at what then existed, and was essentially different; that Art-Unions have notoriously existed, while the Legislature has had bills before it for the suppression of gambling; that it has rejected amendments to those bills, whose scope was to prohibit such lotteries; and that, in general, the citizen is always at liberty to do what he pleases, unless the law to restrain him be clear beyond a doubt. Part of this reasoning the Art-Union adopts, and bases upon it a claim for itself to distribute works by lot; the rest it denies, and upon its wilful construction bases the proposition that no person and no other Association has a right to distribute in that way. It claims

a monopoly of the lottery business—denying, however, that its distribution by lot is a lottery. Thus does this domineering oligarchy endeavor to clutch all power of patronage, to collect into its own coffers all that the public can be cajoled out of, and to wield that enormous patronage for its own glory, and the reward of its own vassels, and the ruin of all who have dared to dispute its authority.

I know little of law. I do know, however, that the vulgar political quacks who predominate in the Legislature are as domineering as any oligarchy in London, or Paris, or Rome, or even in Naples; and with my whole soul I thank God that their reign is brief. They shake their brutal fists at the capialist, and say, "you shall not take more than seven per cent. interest from this fellow Melton, with his tea-kettle, who pretends that he can propel boats by steam; or if you lend him money, and on pretence that his projects are hazardous, charge him for risk somewhat more than we permit you to charge to those who mortgage to you good land, worth twice your money, then at your own risk be it; if this Melton prove a rogue, not only we will not compel him to pay you; but if you attempt to compel him, we will shave your head, and make you hammer stone for some years; we will hold your hands while he picks your pocket, if you think it doubtful whether he will be able to pay you, or willing if able, and therefore stipulate for compensation for the hazard." That insolent domineering dead-levellers and blackguard agrarians who enact and uphold laws so stupid and atrocious as this law, which virtually denies to the liberal capitalist his fair and full claim upon the property which the inventor may acquire by his genius, aided by a loan at great hazard, in case the appearance of that helpless man of genius should prove deceptive, and he should be a scoundrel and plead usury,—it is not improbable that they who maintain such a law should say to artists:—"you frivolous parasites, you shall not take five dollars each from a number of your friends and gingerbread dilettanti admirers, and determine by lot which of them shall have the useless ornamental work of yours, that can fill no empty stomach; if you do, we will sell your trumpery at sheriff's sale, appropriate the proceeds thereof to the feeding and rearing of that highly useful class who are bred in our liberal institutions, the almshouse; and, for yourself, you speaking dog, we will shave your silly pate, and your hairy face to boot, and set you to hard labor for two years in another institution of ours, in which we maintain in a rather profitless way such of our sovereign citizens as swindle their neighbors in modes that we do not allow nor wink at. No! contemptible slave! go to the Art-Union; they are the men whom we have set up to rule over you, and their lottery, though we do not authorise it, yet we wink at it; and they, with their money, can tickle judges, and influence prostitute advertising newspapers, and keep themselves out of hot water, if they can't keep out of dirty water."

My own opinion is, in accordance with that of the late Sir Robert Peel; who, when he presented a petition to Parliament, from the London Art-Union, praying for an authorisation to draw its lottery, said that he did not believe that the statute against lotteries was ever intended to prevent such uses of the principle as that which the Art-Union had practised for years; but since some persons had started doubts, and the directors deemed it proper to relieve the scruples they felt while they were in this uncertainty, he was willing that Parliament should grant the prayer of the petition. And it was granted. I further agree with that eminent statesman and liberal patron of artists, that Art-Unions are not the best means of promoting art; but, if, in some cases, they may serve to diffuse tolerable works among those who have no other means to obtain them, the government should not deprive them of the liberty to do so. And I go further than he went; though for England what he said was true: I say that for our country Art-Unions are the only means of promoting art, that we now have to rely upon. Better means will be found, when the artists have the common sense to come together upon the democratic principle, and elect a common council, to manage the public affairs of art, and not to confer titles, and send works of art at random to those who would rather choose for themselves.

Proper local organizations, upon the model of our political institutions would soon

lead to an Artistic Congress in Washington; that Congress would establish a National Art Lottery for prizes of such amounts as subscribers entered their names for; these prizes would be represented by certificates payable in cash to artists; the money would lay upon interest until called for, though it might be a century. This is *all* that an Art-Union is good for: the lottery feature of it is the only good feature; the print publishing is bad, inasmuch as it cannot suit all tastes; the Bulletin business is a government puffing machine—an abomination; and the advertising patronage is a means of black-mailing and bribing the public press and thus corrupting the fountain of criticism. As to the "beautiful free gallery," it is an ill-designed and ill-arranged affair, in which no person of good taste can be comfortable; and it has been so negligently guarded that prostitutes have made use of it for the purposes of their trade, to such an extent that many ladies have refrained from entering it.

A common council of artists would soon establish a gallery, sufficiently free; free at least from objections of this nature; and free from the control of impertinent meddling blockheads who presume to stand between men of genius and men of taste.

A FEW REMARKS UPON THE JOURNAL LA LUMIERE.

New Manual of Photography, by M. E. De Valincourt.—Monumental Italy, in twenty plates; and Photographic Impressions, by M. Eugene Piot.

As a literary, artistic, and scientific compilation, the Journal La Lumiere, which traces the progress of heliography, is a remarkable memoir of its rapidity, and the active impulsion which our age communicates to new discoveries. Only ten or twelve years have elapsed since Daguerre proclaimed the secret of his method, and already the history of the improvements and applications which it has received, constitute the elements of a complete voluminous theory. Already have the various ingenious productions of photography created, in the art of designing, a special branch sufficiently curious, sufficiently fruitful, to interest the public and the critic with its annals.

Photography, which embraces chemistry and natural philosophy; which has modified the construction of optical apparatus, and the former theories upon light and color, at present possesses a very extensive bibliography. Under the generous impulsion of a liberal spirit, zealous and enlightened, this discovery, so young and so fruitful, furnishes matter for a periodical publication: a *Review* devoted both to the sciences and arts. As if to testify to the opportuneness of the noble and salutary thought of M. De Montfort, America has imitated the example.* London will soon have its photographic journal. New York has two.† So that France, the mother country of this discovery would have been distanced, had not the munificence of M. De Montfort by this means enriched, rendered popular and accelerated the progress of heliography.

If, therefore, (and we do not doubt it,) our country in future maintains its priority to practical skill, by making improvements,

* This is a mistake; the first Journal devoted to the Photographic Art was published in America; therefore America did not imitate. The idea was first originated by a professor—his name we have forgotten—of the Oberlin (Ohio) University, and afterwards fully carried out by ourselves without the least knowledge of the French Journal, which was commenced simultaneously with our own.—*Ed. P. A.-J.*

† Only one, we are sorry to say, appears now to exist.—*Ed. P. A.-J.*

it will be under obligation to the benevolent man who has gathered around him the luminaries of science, and the most able photographers, and who has given them a literary organ in which to consign their observations and diffuse them abroad. This idea fully shows an entire love of the science, not because M. De M. is our compatriot; but because elevated souls exist in every country.

Received with an eagerness which does honor to the wisdom of our founder, the publication of *La Lumiere* obtains a rapidity of success which has surprised us. Delicate as may be the modesty of our patron, he must, nevertheless, receive here the grateful homage of his fellow citizens and his numerous readers: in the expression of this acknowledgement, we interpret a universal wish and sentiment.

The reflections which have led us to this relative digression from the rapidity of the theoretical and practical march of heliography, as well as the double end of this scientific and *artistic review*, have been suggested by two new works, placed under our eyes: one devoted to the practice, the other destined to furnish the first example of a purely esthetic principle.

Returning to the memoirs, dissertations, articles of journals, partial treatises heretofore published, and curious documents, M. De Valicourt has constituted himself at the same time the chronicler and guide of heliographers. He compiles a portable encyclopedia of theories and arranges them in a Manual *of photography upon metal, paper and glass.*

Thus, the discovery of Niepce and Daguerre reaches beyond the direct limits of *speciality*, and is brought down to the means of the multitude, under the economical, popular and complex form of the "Roret Manuals."

The application of Photography to the arts has advanced it to an analagous and somewhat parallel result, under the impulsion of M. Eugene Piot, who, approaching the domain of iconographic monographs, publishes, with explanatory and historical text, "Monumental Italy."

We will proceed in order; and as theory precedes practice, we will speak first of the "Manual of Photography." This work deserves its title by reason of its critical value. Taking *ab ovo* the discovery of Niepce, and holding up to examination instruments of production, M. De Valicourt describes the heliographic works emanating from Wedgwood and Davy, as well as improvements in cameras from the time of Porta to Wollaston, and from Wollaston to M. Charles Chevalier, who increased its power two-fold by the invention of the double object-glass.

In this enterprise, the author, from the first pages, shows the commendable spirit which actuates him by protesting against the unjust appropriation by *Germany* of object glasses for the improvement of which we are indebted to one of our countrymen. This character of loyalty; this absence of sordid passions and partiality, characterizes, throughout the work of M. De Valicourt, who, called to enumerate a prodigious number of partial discoveries, of processes more or less happy, of which several persons contend, and sometimes with candor for the priority, has almost always kept himself from being implicated in personal quarrels.

The author, who is intimately acquainted with his subject, has taken care in this respect, to inform himself with scrupulous accuracy, in order to keep the promise of his inscription: *suum cuique.*

Moreover, it must not be supposed that this task is the easiest in the world: the innovations, and the methods of detail described, do not fall much short of a hundred, and, as for the authors, whose researches are analyzed, I have counted more than forty. M. De Valicourt has harvested, and then gleaned; he has fully compared the cedar with the hysop, and put everything in its proper order.

That part of the *Manual* relating to the daguerreotype on plate is so complete and so decidedly divested of controvertable opinions; of hazardous conjectures or uncertain ideas, that in reading it we admire the degree of improvement which heliography on plate has attained, and we are convinced that, in this branch of art that there is no farther advancement to make. Here the *Manual* offers us a choice between rival methods, more or less tested. It retraces, satisfactorily, a history completed, and declares that the interest connected with the perfectible inventions which may still be improved without measure, ought to be concentrated hereafter upon

photography on paper. The author goes so far even as to prophesy the brilliant destiny of this branch of the photographic art which has taken a remarkable flight in these latter days, "and which seems destined *some day to dethrone the daguerreotype on plate.*"

These predictions, which strengthen ours, fully justify our predilections that, according to the concession of M. De Valicourt, artists,—*people of taste*—have a marked preference for the design on paper. This preference, the author wisely explains in a few lines worthy of quotation, for they admirably sum up the qualities which give a *spirit*, a life and thought to photographic designs.

"In the ordinary daguerreotype, when we have acquired a certain method, success is, so to speak, mathematical, and the uniformity of the means employed yields an identity of result with the precision and regularity of a machine. Such is not the case in photography on paper. Here, the endless variety of resources at our disposal transforms the photographer into a veritable artist who always remains the judge in the choice of the means, employing and directing them at will, according to the different effects which he proposes to obtain. He thus creates a certain air to the picture and stamps upon each of his works an original and individual style which, to a practiced eye is equivalent to a signature.

"If we look into the future for what appears reserved for photography on paper, we will see that it is at present susceptible of numerous and useful industrial applications. In a little while the different branches of trade will call upon it for the plans of their work, intended to be communicated to distant patrons as specimens of their more agreeable models; engineers and architects will commit to it the reproduction of their designs and plans; painters and sculptors that of their works; paleologists* numismatologists† will make use of them to multiply manuscripts and the representation of curious objects. To realize all these wonders, it would be necessary to create a heliographic press, &c."

These sympathies do not prevent the author from judging of the merits of photography with a clear critical sense, sometimes even too severe, for he reproaches him with wanting *purity of outline* who recommends proofs on metal. This judgment is ill-advised; the *purity* of the outlines or of the design do not consist in barreness of manner; although it be soft and stumped the *line* of the Corrége is certainly as *pure*, and even purer, than that of a contemporary, Van-Eyck or Cimbabue; only the former is more charming, and somehow, more intellectual. Such is the line of photography on paper, the principal character of which is left to the effect and model of the plans.

We also discover that M. De Valicourt, has enumerated the researches of various photographers, from Mr. Talbot—who would be the first if Niepce had not, no later than 1826, opened the march—and derogates with his accustomed benevolence, in referring to M. Bayard, by misrepresenting the silence which he had a long time maintained upon the composition of his photogenic papers. Moreover, instead of insisting upon the *direct process* due to M. Bayard, M. De Valicourt, falling into the error for which he reproaches the rivals of M. Chevalier, describes first a direct process exhibited at York by M. Grave; then another of M. Bousignes, and this is under the form of a corollary, as he afterwards lightly mentions, and as if with regret, M. Bayard acknowledging that he had discovered his process in 1839. *Sic erunt primi novissimi.*

It would be easy for us to point out the counterpart of these errors of detail; but when partiality is revealed by an excess of admiration and of charity, we leave him the broad field. To turn the shaft of the critic when it is misdirected is a laudable enterprise; to plunder flowers which are offered by a friendly hand, is not an office that meets with our approval. We must not, in general, be infatuated with the tifling of very bold, very fruitful, and very seductive theorists, because the abuse and confusion of theories induce disorder in the manipulations, and often cause uncertainty. We shall not follow M. De Valicourt in a series of panegyrics too exclusive from our meaning, and we will now limit ourselves by presenting one of the wisest reflections of his preface. "Photographic processes,

* Those who write on antiquity, or are conversant with it.

† Those versed in the knowledge of coins and metals.

the most seductive in theory, have no value to us except what they derive from time and experience."

I know not that M. Eugene Piot sets himself up in the science to be the father of all theories, and to wed chemistry to the fine arts in the same manner as the ivy to the elm. He has the privelege of doubting it: M. Piot produces much, promises little, thinks more, operates with simplicity, and appears to us more zealous to bring us treasures, than we are to give him credit for their acquisition.

M. Piot is called to render immense service to the artist. What good fortune it is for an amateur who, like him, has described the monumental curiosities of the West and of the South, without discovering the representations of these wonders, worthy to satisfy a fastidious mind; what good fortune, I say, is it to find an instrument like photography becoming a minute and accurate delineator from day to day!

After comparing the processes, which he has composed in the country and upon the field, M. Piot realizes a speculative application of photography to the arts. *Monumental Italy*. He has prepared his *album* and then announced it; thus exceeding in practice the programmes of M. Blanquart Evrard.

M. Piot is the first, therefore, to engage in competition with the engraver; the first among us to present a popular edition of a photographic work by *parts*.

Drawn upon China paper, the proofs of *Monumental Italy* are pasted upon a white paper with double margin, bearing, like stamps, their engraved *type*, comprising *fac similies* of the monuments, and, by superscription, the title of the publication. These are fine large engravings of the dark kind, with which nothing can compare. An index will accompany these plates. Thus commences the series of volumes, the travels of art illustrated by photography. M. Piot creates a new commercial branch.

The author opens the campaign in the town of Pisa, and from the first plate, representing the *leaning tower*, he furnishes us the occasion of pointing out the superiority which distinguishes heliography, as to absolute precision and to the influences to be drawn therefrom.

There was much discussion upon the causes of inclination of this campanile building in the twelfth century, by Guillaume of Inspruück, and Romano of Pisa. Debrosses attributed this oddity to a caprice of the architect; the most impropable opinion, and which for this reason has found credence among the vulgar, in spite of Basari, Bernouilli, La Condamine, and Soufflot, who have all reasonably attributed the deviation from the perpendicular, to a settling of the ground. If this were still a disputed question, the photograph of M. Piot would immediately decide it, by showing us that the whole place, composed of alluvial earth, sandy and unstable, is covered with houses which all lean, more or less, either on one side or the other.

Formerly, when artists reproduced this site, they suppressed slight imperfections in their drawings, and exaggerated the inclination of the tower, by representing the houses in a vertical position. Three gothic arches of the *Campoo Santo* of different ornamentation, and separated by medalions in relief, give us a second view of the monuments of Pisa; the scene being completed by the view of *Piazza del Duomo,* which comprise the whole. This last proof is well developed, but a little gray.

The two other engravings of this number transports us to Florence, opposite the two side doors of *Santa Maria del fiore*, constructed in the gothic style, with panels in which the curvature and rectangular frames unite to a point and foreshadow the Renaissance. However, the edifice is of 1296 but it is of Arnolfo di Lapo. We see that in Italy, and especially at Florence, this word Renaissance does not possess a very definite meaning as among us. The arts, in these small republics of poetic imagery with those of Greece were not restored. To comprehend it, would be sufficient to view with the aid of a magnifying glass, the two charming virgins who crown the first door, upon the two fine plates of M. Piot, the kneeling seraphims that surmount the second; to study at the entablature of crosses, under the frieze, and the pediments of the doors, those myriads of arabesques, flowery helixes, medallions, roses, garlands, and these boquets of marble with which the edifice is strewn, and which, thanks to M. Piot, the engraver

presents for the first time to the delighted eyes of amateurs who have not been blessed by Heaven with the privilege of going to Florence. FRANCIS WEY.

THE STEREOSCOPE, PSEUDOSCOPE, AND SOLID DAGUERREOTYPES.

THE present day fortunately so abounds in invention, that, no matter how unexpected or curious a discovery may be, it scarce excites any wonder. Tell people that you can brew lightning in a little crock, and send it for hundreds of miles over land and under sea, they don't quite believe you until they have had a message between London and Paris answered and then they take the whole matter quietly for granted as a thing of course, and go home and think no more about it. Announce that an engraving showing every detail of an interior of the Exhibition was engraved from a picture taken in ten ticks of a watch, people smile and look incredulous; but let them stay, watch in hand, and count the seconds whilst the daguerreotype camera window is open, then show them the pictures, and let them on the spot look from it to the reality until they have recognised every minutest particular, they will begin to speculate how cheap should be the picture so instantaneously produced; and with the fact before them, and no cabalistic flourishes or witchcraft doings in the matter, all wonder ceases. True, where discovery cannot so plainly produce its proof, ignorance and presumption, incapacity and unbelief, still find refuge enough for boastful sneers against laborers in the hidden mines of fact and truth. We have not yet reached the period when all men shall be content to bear announced discoveries however strange with patience, or else shall lend their help to working out the truth, or grinding down, atom by atom, the falsehood or fallacy; but we have at all events passed the age when the cloven-foot of some evil spirit was looked for side by side with every step of progress that human intelligence attained. Time was, when it would have gone hard with any one who showed pictures of men and scenes that neither pencil-brush nor hand had touched; and if, in defence, it had been asserted that the sun itself had traced them, the tortures of the rack would have been had in requisition to force the inventor to confess himself a wizard, and to tell his term of compact with the devil; and,

REFLECTING STEREOSCOPE.

in our own time, though we have passed from the demonism, there is a lingering tendency to set down those who go exploring beyond the bounds of knowledge as

madmen. Almost any one can find instances, but we are content to mention one which has connexion with our present subject. At the close of a lecture by M. Dumas, the well-known French chemist, a lady came to him in the lecture-room ; she had a question of great moment to ask him "Did he think it possible that the pictures seen in a camera could be caught and made permanent ?" she was anxious to know what he, a man of science, thought on the subject. Her husband had been seized by the idea that he could fix these pictures, day and night he was haunted by the thought and she feared he might be mad. But if a philosopher like M. Dumas thought there was any probability in the notion, it would give her the belief that her husband might be in his senses. Dumas assured her that, though he saw no way to fix the pictures, enough was known to prevent him from saying it was impossible and to make it a matter worthy of inquiry. The lady's husband was Daguerre the painter; and some ten years after this conversation with Dumas, he had solved his problem and taught the world how to make the sun itself fix as pictures everything it shone upon; and this discovery has now enabled us more completely to solve, not merely to the understanding, but to the actual sight of every one the problem so long the puzzle of philosopers—the use of our two eyes, and how it comes that seeing with two eyes we still see but one of each object. The discovery, however, does more than clear up the scientific difficulty, it opens up a new field of entertainment and instruction, to which our Engravings will serve to introduce our readers. But first a word as to the discovery itself.

FIRST NOTICE OF THE STEREOSCOPE.

On the 21st of June, 1838, Professor Wheatstone read a paper at the Royal Society "on some previously unobserved phenomena of binocular vision" (sight with two eyes) ; in the course of which, he described an instrument invented by himself, by which two perspective diagrams of the same solid were seen at one view as completely solid as the object itself.

In 1839 Mr. Wheatstone brought his discovery before the British Association, at Newcastle, where it gave rise to a discussion of great interest, in which Sir D. Brewster and Whewell took part, and Sir John Herschel characterised the discovery "as one of the most curious and beautiful for its simplicity in the entire range of experimental optics."

In Germany the subject excited still more interest; it was at once eagerly taken up. The new light thrown upon the subject of double vision engaged the most able physiologists and metaphysicians--Bruecke, Volkman, Morer, Tourtual; and in Geneva, M. Prevost wrote upon the subject.

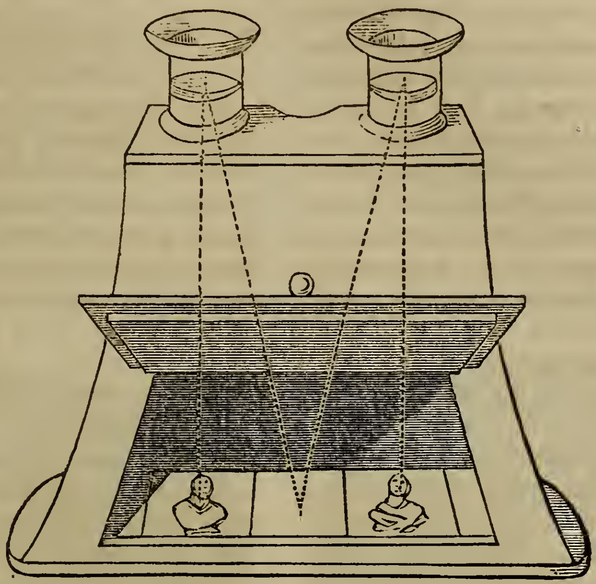
In the commencement of 1839, the photographic art, upon which Niepce, Talbot, and Daguerre had long been at work, was announced ; and Mr. Talbot and Mr. Collen, in the same year at Mr. Wheatstone's request, prepared photographs of full-sized statues, buildings, and portraits, for the Stereoscope.

Mr. Wheatstone's diagrams were proof that small drawings may be made to represent under the stereoscope the complete effect of reality. Two miniatures might be painted, each with one eye, if the artist could attain sufficient accuracy, which seen by the stereoscope, would be seen as one, and round as life.

But these were only illustrations of an important addition to science. A new step was gained in explanation of the phenomena of sight. It was clear that the inner eye (if we may use the phrase) was furnished with two outer eyes, not merely for the uniformity of the face, nor to puzzle philosophers, but to present an instantaneous perfect vision of the form and position of objects. The one eye, in fact, seeing round one side, the other eye round the other side, and the inner eye having thus brought before it in one and in full solidity the whole object.

The form of the Stereoscope, as originally produced by Professor Wheatstone, and which he called the reflecting Stereoscope, is shown in our Engraving; and it is, on many accounts, the most convenient form, as it allows of every adjustment, and can show pictures of any size. But, for small daguerreotypes, the refracting or prismatic Stereoscope (also constructed by Mr. Wheatstone) is better adapted. Several ingenious modifications of the instrument have been made by Professor Dove and Sir David Brewster. The latter, which is most generally in use, as made by M.

Soliele, of Paris, has the appearance of a double opera-glass; and the modification consists in the substitution of quarter lenses for the prisms employed by Mr. Wheatstone; the eye-glasses refract, or, in other words, throw the images out of the direct line to the centre between the eyes; and each image being in this way removed in a direction towards each other, combine, and thus produce the effect of solidity.



REFRACTING STEREOSCOPE.

A reflecting Stereoscope may be readily constructed from our illustration; and, as a philosophical toy, will afford, perhaps, more amusement, and certainly excite more astonishment, than the well-known kaleidoscope. It simply consists of two pieces of plate-glass, two or three inches square, at right angles to each other. The objects, or designs, are fixed on at each extremity of the instrument, at a distance of two or three inches from the reflecting mirrors, care being taken to place each design in its proper position. In our illustrations the designs are intended to be looked at by crossing the vision, or squinting; in using them with the Stereoscope their positions must be reversed. Mr. Holmes, the popular lecturer on science, &c., to whom we are indebted for this series of perspective drawings, is preparing a cheap portable Stereoscope, which will bring the appreciation of this beautiful discovery within the range of all classes.

DAGUERREOTYPES FOR BOTH EYES.

But so long as mere drawings by hand were used, it might be held that the effect, however wonderful, was but some trick of art by which the senses were cheated. But the daguerreotype admits of no trick; the silvered plate has neither line, nor light, nor shade, but such as the sun gives it; the two plates in the two cameras stand truly for the two eyes, and receive each just such picture, no more, no less, as each eye receives. There is, therefore, no further room for doubt as to the need for two eyes; we have taken by the daguerreotype the very picture from each, and have made them tell their secret. Our double vision is but perfect vision.

HOW ONE-EYED PEOPLE OBSERVE SOLIDITY.

But here there is need to answer an objection. It will be said that persons with one eye nevertheless see distinctly, and see perspective and rotundity. They do so; and there is neither difficulty in the answer nor any refutation in the fact of what we have said as to the double vision. One eye alone judges of the relief of an object, from the accustomed distribution of light and shade, giving perspective appearances, though the perceptions it hence acquires are less vivid than those obtained by means of two eyes. Another curious fact is, that a one-eyed person, when looking at a solid object, is constantly chang-

ing the position of the head from side to side; the result of this is, that he is by this means getting the same effect with one eye that is produced with two eyes with the head stationary. With two eyes, as we have before stated, two images from different points of sight are combined to produce solidity; with one eye, and a constant change of its position, two images in like manner are produced; but the combination depends on the curious circumstance of the second impression falling on the retina before the previous impression has escaped. The retention of objects on the retina some time after their removal is a common fact, and known by most persons. A one-eyed person, with the Stereoscope, by first looking through one side and then through the other, gets the effect of distance and solidity simply, as we have explained, by the retention of the first picture on the retina.

PICTURES AND DIAGRAMS TO BE SEEN SOLID WITHOUT THE STEREOSCOPE.

The Engravings of the bust show the small difference in perspective necessary to produce the effect of solidity. They are fac similies of photographic pictures, by Claudet, which, seen through the Stereoscope, have in every respect the appearance of the original bust.

BUSTS, SHOWING THE TRIFLING DIFFERENCE IN PERSPECTIVE NECESSARY TO PRODUCE SOLIDITY.

Our diagrams of several forms of crystals and geometric solids are illustrations which may be observed without any instrument, to the no small amusement of those who for the first time see them, and may be multiplied in the most infinite variety.* These diagrams are constructed to represent what may be termed right and left eye views of objects, as we should actually see them with the left or right eye alternately. Take, for example, the railway tunnels, and squint at them; three pictures will present themselves, the central one being a combination of the other two, and producing the effect of a perfectly hollow tunnel; in like manner, the other diagrams will combine to form an apparently perfect solid paper. In this case, what is done by the aid of Mr. Wheatstone's instrument is simply effected by crossing the vision, or squinting. It greatly facilitates the squinting to place the point of a needle held in the hand before the picture, and, whilst the eyes continue to regard the needle point, to move it towards the eyes

* See Illustrated London News, Jan'y. 24th, 1852.

until the pictures coalesce, when three images will be seen, and the middle one, which is the only one seen at once by two eyes, will have the solid appearance we have described. Some little inconvenience may be experienced at first in getting this curious and remarkable phenomenon, but a little patience and perseverence will overcome the difficulty, and will be well rewarded by the result. Our artistic and scientific readers, when they clearly understand the theory of this beautiful discovery, will be enabled to produce any variety of subjects; for the regular bodies, all that is requisite is to make one drawing, and simply take a reversed transfer. On using any of the drawings we have given, or copies of them, for the reflecting instrument, the left design must be placed in the right and the right design at the left end. The idea of solidity is evidently produced by the combination of two pictures of a solid body taken from either eye, as from two different points of sight. The perception of distance or perspective Mr. Wheatstone attributes to the same cause; which explains the fact that all paintings and drawings are, in reality, but pictures for one eye, and are seen most like reality when they are looked at with one eye only. We may have distance, dimness, difference of light and shade, but cannot have real roundness and space between and beyond objects, unless each eye has its picture. As it is, our paintings may be said to be one-sided or one-eyed perspective — the whole landscape or portrait as it would appear to the two eyes is not shown.

PERSPECTIVE IN THE STEREOSCOPE—CLAUDET'S VIEWS OF THE EXHIBITION, AND STATUETTE PORTRAIT GROUPS.

But one further point needs explanation as to the Stereoscope pictures. They show not only in single objects, but in perspective: M. Claudet has a number of views of the interior of the Exhibition, and, though but 2½ inches square, the vast extent of the building, every column, girder, and article exhibited, can be seen standing out in its place, and with as perfect solidity and distinctness as the very Crystal Palace and things themselves. Every piece of sculpture is there as sculpture: the tree stands out and shows the glass beyond, between every branch and leaf; it seems no picture, but a model beyond belief for its wonderful accuracy and comprehensiveness of detail. But it will be said that our explanation cannot be true as to distant objects, for that with them both eyes really see the same picture, and yet the views of the Exhibition seen in the Stereoscope have the distant objects, in as full roundness and relief as those at hand. They have, and the reason is, that in this instance the daguerreotype shows us a view as if the pictures were taken from a small model of the building brought sufficiently near for the whole to be within the distance influenced by the angle of the eyes. In fact, instead of seeing the object itself, you see a miniature model of it brought close to the eyes; so that in this instance the stereoscope daguerreotypes actually surpass the reality. No one has ever seen the interior of the Exhibition from end to end with such clearness as it is seen in M. Claudet's pictures.

The complete outstanding perspective of distant portions of the picture in the Stereoscope is not perceived to perfection until it has been looked at for some seconds, though the near portions are seen in their full roundness and solidity at once. This arises from the instrument not being perfectly adjusted to the eyes of the observer, whilst it requires for instantaneous perfect vision a different adjustment for different persons. On attentive observation it may also be noted that the near and distant objects do not appear single at the same instant. This arises from the fact that whilst the near objects are seen by each eye at a certain angle, and so that two pictures form one, the distant objects, with eyes placed at the same angle, are more or less separated, and so are seen more or less distinctly as two pictures. To correct this the eyes alter their distance from each other, and it is only when they have done so with accuracy, that the distant portions of the picture are brought to coincide, that the roundness of the farthest portions is seen as distinctly as of the nearest. This process of adjustment of their two pictures, both as to real objects and their daguerreotypes, the eyes are incessantly at work upon.

But these stereoscope pictures are not only curious, they are beautiful and useful. We may have in future galleries of por-

traits no fictions of painters, but the peo- were—not flat and framed, and hung along the walls, nor in cold marble, but round and real as they looked in life; and so with buildings and scenery, we may have, at a cheap rate, our hall of antiquities—Pompeii as it is, Nineveh as Layard sees it—scenery in foreign lands, in our own, in all the minuteness, grandeur, and beauty of nature. Neither Claude nor Turner could have given any more than half such physical or aërial perspective. The artist may carry in his stereoscope the immortal works of the genius-inspiring masters of every age and country, and wherever the highest living beauty is to be found he may have in an instant his models, subject to no errors of his pencil, but in all the full rich roundness of reality.

Nor is it alone interiors and landscapes and studies that are so admirable; we have seen groups of portraits by Mons. Claudet—in one as many as six full-length figures—the distinctness and roundness of which is so life-like as to be almost startling; and so instantaneous is the process by which the pictures are taken, that there is scarce a limit to the number of portraits that may be given in a single group; even a number of children, difficult as it is to get them to sit steady, mav be taken at once; and, indeed, to have the wonderful effect of the stereoscope, groups are best.

PROFESSOR WHEATSTONE'S NEW DISCOVERY, THE PSEUDOSCOPE.

But we have not yet done with the wonders of binocular or two-eyed vision. On Thursday, the 8th instant Prosessor Wheatstone read a second paper at the Royal Society, and exhibited an instrument which he calls a pseudoscope, on account of its giving false perceptions of all external objects. Some of the illusions were very extraordinary. Its effect may be briefly expressed as making whatever point is nearest seem farthest off, and *vice versa;* so that all objects seen through it seem as if they were turned inside out. A solid terrestrial globe is seen concave, like Wyld's globe, with the map on the inside. The inside of a teacup appears a rounded projecting solid. A china vase, with embossed colored flowers, appear as if it were cut in two, and we saw the side with the flowers indented. A bust shows as a deep hollow mask. A framed picture hanging against the wall seems as if it were let into the wall; and in general objects placed before a wall are seen behind it, as if the wall were a mirror. Other more complicated, and in some cases perplexing, illusions are produced by the instrument, which is very portable, and will, no doubt soon be to be had of every optician, as, from the infinity of its illusions, it is sure, even as a toy, to become popular.

Those who wish to follow further the curious subject of binocular vision, especially as regards its theory, we must refer to Professor Wheatstone's papers in the *Philosophical Transactions*, to Whewell's "Philosophical of the Inductive Sciences," and several papers by Sir David Brewster, to be found in the *Philosophical Magazine;* and to see M. Claudet's collection of Stereoscopic Daguerreotypés, which will enable them better than any description to appreciate this new contribution to science and art.—*Illustrated London News.*

From La Lumiere.

PROCESS OF M. LEMOINE.

IN a former number we published the memoir sent by M. Talbot to the Academy of Sciences, and it now seems to us advisable to analyze the work of Lemoine and communicate his process to our readers. As for his theory, we will not copy it here, nor will we even discuss it; it is not generally known, and those who wish to ascertain it will always be able to study it in the work referred to. We will only say that the able English photographer makes an appeal to the *savants*, by requesting them to lend a helping hand to practitioners, and sets them the example himself. If photography needs the assistance of other sciences, how many new phenomena, of valuable discoveries will it not enrich in its turn!

If therefore, *savants* and practical men unite in their efforts, the success which they will obtain by this common work will be sufficiently excellent for each to acquire his share of glory.

Having made these casual remarks, we return to M. Lemoine's process.

Stir nearly fifty whites of eggs together, adding for each egg used, a centilitre of water and half a gramme of sugar. When the fermentation has changed the mixture into a somewhat viscid liquid, in which swim numerous teguments, add from two to three grammes, for each white of egg, of strong white vinegar, in order to prevent any putrefaction. Filter the liquid so as to have it perfectly clear, and, in this state, it may be preserved indefinitely. Before making use of the albumen thus prepared, it is necessary to add still an eighth in volume of a cold saturated solution of sugar. To use this sugared albumen, take it up with a spoon of ordinary size, and lay it upon the plate of glass which must be kept perfectly horizontal, and spread it with the aid of a strip of glass or a feather.

The drying ought to be effected in a glass oven, closed in such a manner as to exclude the dust, and heated by means of a lamp, until the plates begin to grow red.

After having prepared a solution composed of:

	Parts in volume.
Alcohol at 33° (36 of commerce)	100
Nitric acid at 40°	10
Pure iodine to saturation,	

the plates albumenized should be plunged into it for five minutes and even more. Then place them upright in a sink. They ought to present in this state, a fine orange red tint and be perfectly diaphianous. Let them dry nearly six hours before soaking them successively in the three following baths:

		Parts in weight.
1. Bath of Silver,	Crystallized Nit. Silver,	1
	Distilled water,	10
Accelerative bath,	Flouride of potassium,	1
	Distilled water,	250 to 500
2. Bath of Silver,	Crystallized Nit. Silver,	1
	Distilled water,	20

As soon as the plates are plunged in the first bath they acquire a whitish milky color, owing to the iodide of silver which is formed at their surface. Let them drain a few minutes before submitting them to the accelerative bath in which they ought to remain until they become perfectly opaque, which requires nearly five or six seconds. The last bath should be prolonged very near the same time, after which, without drying the plates too much they are to be transferred to the camera. All these operations relating to the three baths, must be made in the dark, or in a very feeble light, like that of a candle. When the plate has undergone the action of light, withdraw it from the camera and plunge it in the following bath, which you maintain at 80° or 90° centig.

		Parts in weight.
Bath of Sulphate of iron.	Sulphate of iron of com.	3
	Water,	4

If the image be not sufficiently clear, when taken from the bath, you may, after submitting it to water, spread over it a fine coating of nitrate of silver solution (1 part in 100 parts of water) which will immediately give vigor to the shades; then it may be resubmitted to the sulphate of iron and also to the bath of silver, but the first

coating is almost always found to be sufficient. By wetting the plates in alcohol before plunging them in the bath of sulphate of iron, the image generally acquires more vigor. When these operations are completed, the plates must be washed freely in water, after which the image is fixed by placing the plates successively in two baths composed of

	Parts in weight.
Anryhdrous Cyanide of potassium,	1
Hyposulphite of Soda,	20
Water,	400

Leave the plates two or three minutes in each bath. The washing should be afterwards made with water sharpened with acetic acid, and the proofs drained and dried in an upright position.

These images thus obtained may serve as negatives for taking positive images, or even painted black with lamp-black and varnish of mastic with alcohol, although the colored parts of the image appear light upon the dark base which supports them.

Paris, Dec. 25, 1851.

My Dear Lacan,—Your relations with England, and the knowledge you have of the English language, induces me to hope that you will do one of your friends the service of writing to Mr. Talbot, who, he remarks is a very agreeable man. He wishes to obtain some details upon the new process sent to the Academy of Sciences, and which you have published in the last number of *La Lumiere.* This process, of very great interest for photography, completes the discovery of M. Niepce, who, first tried and rendered practicable the employment of albumen in photography. M. Talbot's process differs a little from that recently communicated by M. Lemoine, engineer at Limoges. The addition of alcohol, the *two* baths of nitrate of silver, the definitive immersion in the sulphate of iron are new applications of these several agents, put in practice and published almost simultaneously by the French and English *savants.* M. Lemoine explains clearly in details the order of his manipulations; M. Talbot has given his process more briefly, in a memoir sent to the Academy, and has neglected certain instructions, which, without doubt, you could obtain by correspondence. Thus, is the acetic acid, without qualification, productive of the same results as the crystallizable acetic acid? At what temperature is the alcohol employed? How does Mr. Talbot prepare the proto-iodide of iron? Finally, are the proportions, expressed in grammes in the journal, exact?

Photography on glass, which, until the present time has been the slowest, becomes by this acclerative the most rapid of all the methods. An operation which lasted six minutes is reduced to the fraction of a second—a truly fine and useful result. It is, if I may so speak, *explosion* substituted for slow combustion. This figurative language might perfectly explain the truest photographic phenomenon. What indeed is the most sensitive substance? Collodion: that is to say, gun-cotton dissolved in ether, an emicently explosive composition. Powder is composed of *saltpetre, sulphur and charcoal.* Sulphur, having no affinity for nitrate of silver, is excluded from photographic collodion; it is replaced by ether, inflammable and resinous.

The explosive matter is constituted in the same manner in Mr. Talbot's preparation. Nitrate of silver contains the nitre or saltpetre. . The protoxide of iron contains the carbon. The alcohol, inflammable and resinous, replaces the sulphur. Light is projected by an object-glass composed of powerful lenses which concentrate the action. The iodine which receives the emanations in the shade, instantly combines with the luminous rays: such is the comparison of this strange experiment.

It is important to, as you perceive, to be perfectly informed in relation to the proto-iodide of iron of Mr. Talbot. It seems to me that steel must be preferable to iron; its nature is better suited to the character of the explosive composition, and it possesses one of the necessary constituents, that of carbon; but the analysis of different kinds of steel vary still more than that of different kinds of iron, either native or wrought. In native iron, nickel is constantly found united; in the wrought irons, carbon and silicium are the principal accessory matters. It will be important as well for iron as steel, to distinguish the alloy; for in one manufacture, these products contain phosphorus; in others copper, manganese, &c. &c.

The extreme sensibility of iconogenic compositions renders important, as you

see, the question. It might result from these various considerations, that the steel for cementing, which contains more carbon and phosphorus, wi.l be the best for the proto-iodide of iron.

I close as I have commenced; your relations with England, and your perfect knowledge of the English language, induce me to hope that you will soon write to Mr. Ta bot and obtain a reply from that distinguished man.

Very truly yours,
J. ZIEGLER.

PHOTOGRAPHIC MANIPULATION.*

PART II.

CONTAINING THE THEORY AND PLAIN INSTRUCTIONS IN THE ART OF PHOTOGRAPHY, OR THE PRODUCTION OF PICTURES THROUGH THE AGENCY OF LIGHT.

BY ROBERT J. BINGHAM,

Late Chemical Assistant in the Laboratory of the London Institution.

WITH ALTERATIONS BY THE EDITOR.

THERE are some solutions in which bromine is combined with chlorine and iodine, which are used as accelerating agents. The great difficulty experienced in the use of bromine water is, the small change of color produced by its requisite action on the plate: now it is evident that, if we combine bromine in equivalent proportions with iodine, we may put rather more than twice the amount of color on the plate we could if we used bromine alone, and still have the same amount of bromine on the plate; because rather more than one half of the color from the bromide of iodine will be due to its iodine alone, and the other half will be due to the bromine; by this means the change of color will be much more distinctly seen, and a little more or less color will not be of so much consequence as if we had used bromine alone; to this bromide of iodine we may add chlorine, forming chloro-iodide of bromine; this will take nearly another third part of the coloring on the plate.

We shall describe a few of these compounds, their use, and the method of making them.

42. *Bromide of Iodine.*—This compound is very easily prepared, as follows: Introduce into a small bottle about a drachm of bromine, add to this iodine grain by grain, until the last quantity of iodine added does not dissolve; the bromine will then be quite saturated with iodine, any small excess of iodine will not do any harm but may remain at the bottom of the vessel; when required for use, a few drops should be added to a bottle of water, until it assumes the color of light sherry wine; the plate should be iodized to a clear yellow, and then exposed over this mixture until it becomes of a deep rose color. If iodized more deeply, it should be exposed to the bromide of iodine for a longer period; this will be easily determined in a few trials; or it may be exposed to this solution for a certain time, in the same manner as to the bromine water. This plan is strongly recommended by M. de Valicours in his excellent and very complete treatise on the daguerreotype.* He gives the following directions for its use in this way.

43. The plate having been iodized either

* Continued from vol. 3, No. 2, p. 124.

* Galvanoplastic et Daguerreotype, par M. de Valicours.

to a deep yellow, just changing to a rose (*transition due jaune au rose*), a bright rose, or a very dark rose or violet, pour into the pan a quantity of diluted bromide of iodine of which the strength is known, sufficient to cover all the bottom of the pan; after about a minute has elapsed, place the plate over the vessel, and begin to count seconds; the time will, of course, vary according to the size of the vessel, the strength of the solution, &c.; however, as some indication of the requiste time we may state, for a plate iodized to a deep yellow, thirty or forty seconds, a bright rose forty or fifty, for the deep rose or violet fifty or sixty seconds may be required.

44. M. Claudet uses the bromide of iodine, but in an extremely diluted state; he makes the solution so weak that it requires about half an hour to apply the requisite quantity of vapor, and his argument is very plausible; he states that by this plan there is a much greater certainty of obtaining an uniform quantity of the mixed vapors on the plate, for a few seconds, or even a minute or two, more or less, does not make so much difference to the plate, as a second or even a half of one does, when the solution is used very strong; he uses numbers of small earthenware pans, not inclosed in any case, to hold the solution, and prepares either eight or sixteen plates, according to their size, at one time.

45. When the bromide of iodine is used, it is better on the first trial to observe the color of the plate, and at the same time notice how long it takes to attain that color with a certain strength of solution; by this means it is very easy afterwards to prepare a number by merely exposing them for the observed time over the bromide, for the mixture is very constant in its action, and remains so for some time. There are various methods of preparing bromide of iodine recommended; but we have given the only one by which constant results can be obtained; for if we adopt some of the other plans, the operator is never certain of obtaining the same amount of bromine on the plate each time, the bromine evaporates and leaves merely iodine in solution; this *colors* the plate equally as well as the bromide of iodine, but of course communicates to it no sensitiveness.

46. *Hungarian solution.*—This is a very favorite solution with most amateurs, and deservedly so. It was invented by M. Guérin, who has retained a secret the method of its preparation; it may be used in the same way as the bromide of iodine, but it is better to use it very weak, otherwise small spots will form on the plate; any tint of iodine may be used, or the plate may be exposed over the Hungarian solution alone, without having previously iodized it; this plan, however, gives a very gray, poor tone, but the plate is very sensitive. When this mixture, or the bromide of iodine is used, the plate should not be exposed the second time to the iodine; but when the required tint is obtained, the plate should be carefully placed in the camera box; this removal, of course, should be performed in a dark room.

47. *Wolcott's accelerating mixture.*—This mixture is a very good one, and employed by Mr. Beard at all his establishments. It consists of chlorine in combination with bromine. We are not acquainted with its exact method of preparation; but a mixture not unlike it may be made by dissolving bromine in a mixture of two parts muriatic acid, and one of nitric acid, the bromine is added to this until it will dissolve no more. The red liquid thus obtained is to be decanted from any excess of bromine, and when required for use, two drachms should be mixed with eight ounces of water, allowed to remain for about half an hour, and then used in the apparatus, (§ 21); the same tints should be obtained on the plate as directed for bromine water. (§ 28)

48. *Chloride of bromine.*—This may be prepared by passing a current of chlorine through a vessel containing bromine. A mixture of two parts muriatic acid, and one of black oxide of manganese, should be placed in a flask. To this flask a bent tube is adapted, passing through an opening into a two-necked bottle. This tube should dip into a little bromine placed in the bottom of it; another tube should proceed from this, and just dip below the surface of some water in another vessel; a very gentle heat is then to be applied to the flask containing the manganese and acid, a current of chlorine gas will pass through the bromine contained in the two-necked bottle; in a short time the bromine will change color, and a vollatile yellowish-red fluid is obtained; this should

be diluted with water and used in the same way as Wolcott's mixture. In this and all accelerating solutions *not* containing iodine, the plate should be placed over the iodine a second time, as directed for bromine water. (§ 28) Chloride of iodine may also be prepared in this apparatus. Iodine should be placed in the second vessel, and then gently heated; when the current of chlorine is passed, the lamp may be removed from the iodine; the action should be stopped after the liquid produced becomes of a brownish-red color.

49. We shall conclude our notice of accelerating compounds by an extract from the *Philosophical Magazine*, in which we have described a method of using bromine which possesses many advantages; the arrangements described (§ 22 and 23,) are the best adapted for this compound; if an earthenware pan is used, it should be thoroughly dried, this is readily accomplished, by placing it in a common oven at a moderate heat for about an hour, this will effectually remove the moisture out of the substance of the pan, which it is necessary to get rid of, for after the vessel has been used for containing liquid of any kind, it obstinately retains moisture, which infallibly spoils the bromide of lime if placed in it.

50. "'*An improvement in the Daguerreotype processs by the application of some new compounds of bromine, chlorine, and iodine with lime.*'*—All persons who have practised the daguetreotype must have remarked, that in warm weather a considerable deposition of moisture takes place upon the plate or slate cover used to confine the vapor in the bromine or accelerating pan. This moisture must necessaily condense upon the cold metallic surface of the plate during the time it is exposed to the bromine vapor. In fact, I have been informed by a number of professional daguerreotypists (and I have experienced the difficulty myself), that they were unable to obtain perfect pictures during the excessive heat of the late season; and a very clever and enterprising operator, who last year made a tour on the continent, and brought some of the finest proofs I have ever seen, entirely failed this season in obtaining clear and perfect pictures, from the constant appearance of a mist or cloud over the prepared surface. This appears to be caused by the deposition of moisture upon the plate, arising from the water in which the bromine is dissolved. To obviate this, some have recommended the pan to be kept at a low temperature in a freezing mixture: and M. Daguerre, in a communication to the French Academy of Sciences, recommends the plate to be heated: but in practice both these plans are found to be unsuccessful. (See Lerebour's *Traite de photographie.*)

* By R. J. Bingham, Chemical Assistant in the Laboratory of the London Institution.—From the *London and Edinburgh Philosophical Magazine*, for October 1846. Communicated by the Author.

51. "It appeared to me that if we could avoid the use of water altogether in the accelerating mixture, not only would the difficulty I have mentioned be avoided, but a much more sensitive surface would be obtained on the plate. With this view I endeavored to combine bromine with lime, so as to form a compound analagous to bleaching powder. In this I was successful, and find that bromine, chloride of iodine, and iodine, may be united with lime, forming compounds having properties similar to the *so-called* chloride of lime.

52. "The bromide of lime* may be produced by allowing bromine vapor to act upon hydrate of lime for some hours: the most convenient method of doing this is to place some of the hydrate at the bottom of a flask, and then put some bromine into a glass capsule supported a little above the lime. As heat is developed during the combination, it is better to place the lower part of the flask in water at the temperature of about 50° F.: the lime gradually assumes a beautiful scarlet color, and acquires an appearance very similar to that of the red iodide of mercury. The chloiodide of lime may be formed in the same manner: It has a deep brown color. Both these compounds, when the vapor arising from them is not too intense, have an odor

* I call this substance bromide of lime, although there is a difficulty as to the composition of bleaching powder, and which would also apply to the compounds I describe. Some chemists regard the *chloride of lime* to be a compound of lime, water and chlorine. Balard thinks it is a mixture of hypochlorite of lime and chloride of calcium; and the view of Millon and Prof. Graham is, that it is a peroxide of lime, in which one equivalent of oxygen is replaced by one of chlorine.

analagous to that of bleaching powder, and quite distinguishable from chlorine, bromine, or iodine alone.

53. "Those daguerreotypists who use chlorine in combination with bromide, as in Wolcott's American mixture, or M. Guerin's Hungarian solution, which is a compound of bromine, chlorine, and iodine, may obtain similar substances in the solid state, which may be used with great advantage. By passing chlorine over bromine, and condensing the vapors into a liquid, and then allowing the vapor of this to act upon lime, a solid may be obtained having all the properties of the American accelerator; or by combining the chloro-iodide of lime with a little of the bromide, a mixture similar to that of M. Guerin's may be produced: but I greatly prefer, and would recommend the pure bromide of lime, it being, as I believe, the quickest accelerating substance at present known. By slightly coloring the plate with the chloro-iodide, and then exposing it for a proper time over the bromide, proofs may be obtained in a fraction of a second, even late in the afternoon. A yellow color should be given by the use of the first substance; and the proper time over the bromide is readily obtained by one or two trials.* With about a drachm of the substance in a shallow pan, I give the plate ten seconds the whole of the first day of using the preparation, and add about three seconds for every succeeding one. The compound should be evenly strewed over the bottom of the pan, and will last with care about a fortnight.

54. "The great advantage of this compound is, that it may be used continuously for a fortnight without renewal: and, unlike bromine water, its action is unaffected by the ordinary changes of temperature.

"I hastened to communicate this during the present fine weather, believing that it will be acceptable to all interested in this beautiful application of science."

We have now come to the third operation, namely, obtaining the impression on the plate by means of the Camera.

* It is better to count time both over the iodine and the bromine of lime; the exposure of the plate to the iodine, after it has received its proportion of bromine, should be one-third of the time it took to give it the first coating of iodine. We have found that if less iodine than this is allowed to the plate it will not take so much mercury, neither will the picture produced be so bold and distinct (28, 29, 30).

THE CAMERA.

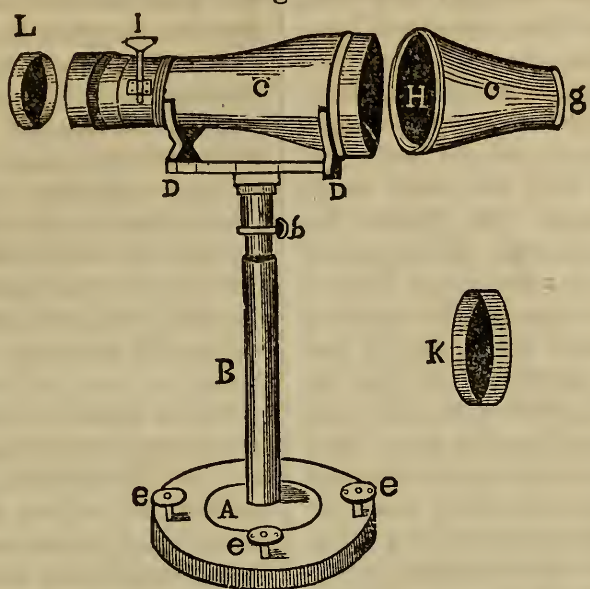
55. *Camera.*—This apparatus we have before described in Part 1, as adapted more particularly for the processes on paper, and the only modification absolutely necessary to render the same instrument useful for the daguerreotype is the frame for holding the plate in the place of paper during the time it is exposed to the light; however, as it is more convenient to have a camera purposely constructed for the daguerreotype, we shall proceed to describe two or three of the forms best adapted for this process.

56. Fig. 1 represents the old German, or Voigtlander's Camera; it is made entirely of brass, so that variation of climate has no effect upon it. It is very portable, and when packed in its box, with all the necessary apparatus and materials for practising the Daguerreotype art, occupies but little space.

The brass foot A, is placed on a table, or other firm support, and the pillar B screwed into it; the body of the camera *c c* is laid into the double forked bearing D D. The instrument is now properly adjusted by means of the set screws *e e e* in the brass foot, or it may be raised, lowered, or moved from one side to the other, by the telescope-stand, and when correct, fixed by the screw *b*. The landscape or portrait to be delineated is viewed either through the small lens *g*, or with the naked eye on the ground glass plate H, the focus being adjusted by the screw 1. The optical part of the instrument consists of the small set of achromatic lenses presently to be described. When the view or portrait to be taken is delineated on the ground glass to the entire satisfaction of the operator, the brass cap L is placed over the lens, and the entire body is removed away into the dark, taking care not to disturb the position of the stand. The body is now detached at the part H, and the plate inclosed in the brass frame *k* introduced in its place: the whole is again placed on the pedestal, the brass cap L is removed, by which the paper or plate is exposed to the full influence of the light after which the cap is again replaced.

57. Mr. Beard patented a camera in

Fig. 1.



which lenses were altogether laid aside, and their place supplied by a concave mirror. The advantages derived from this construction is the greater rapidity with which it acts, but there are many inconveniencies attached to it; it is only applicable to the small-sized plates, neither is it so portable or easy of management as the others.

58. *The lenses.*—The diameter and focal length of these must depend in a great measure on the distance of the object, and also on the superficies of the plate or paper to be covered. For portraits, where great quickness is required, and the size of the pictures not an object, one of 1½ in diameter, and from 4½ in. to 5½ in. focus may be used; but for distant views, one from 2 in. to 3 in. diameter, and from 8 in. to 16 in. focal length, will be found to answer better. A variety of moveable apertures or diaphragms are often useful, as by them the intensity of the light may be modified, and more or less distinctness and clearness of delineation obtained.

59. Though the single achromatic lens answers very well for copying engravings, taking views from nature, buildings, &c., for the portrait, figures, and groups from life, it is almost entirely superseded by the double achromatic, which acts very much quicker. These have been brought to great perfection by M Voigtlander, of Vienna, under the direction of Dr. Petsval, Professor of Mathematics in that University.

60. We shall give in our next number an improved form the American camera, it is a very convenient arrangement; admits of great variation in the length of focus, and may be used for copying daguerreotypes where the focus is required to be of the same length as the object to be copied is distant from the object glass; in this case the image formed on the ground glass will be of the same size as the object at which the camera is directed. The plate frames in this camera are so made that the plate can be used either in a horizontal or vertical position without the trouble of turning the camera on its side, and a considerable number of these frames containing the prepared plates, can be packed within the camera.

61. Another, and a very important improvement in this camera has been made by Messrs. Knight & Sons, namely, a readier and less expensive contrivance for altering the position of the plate with respect to the object glass, by which means two objects, differing slightly in their distance from the object-glass are brought to the same focus on the ground glass or plate.

62. We shall endeavor to explain the advantage derived from occasionally placing the plate out of its upright position. It is well known that the focus of any object varies according as it is more or less removed from the object-glass; thus, the proper focus of an object near the lens will differ from that of one placed immediately behind it.

M. Towson was the first person to call the attention of photographists to the dif-

ference between the chemical and visual focus of an ordinary non-achromatic lens; he recommended that after the best visual focus had been obtained, it should be pushed in so as to get the focus of the chemical rays. In part 1, § 45, we have mentioned this subject with reference to the single meniscus lenses. M. Claudet has lately called the attention of daguerreotypists to the fact that the visual focus of nearly all achromatic lenses differs more or less from the chemical focus, and he further states (in a paper read before the Royal Society), that this chemical focus with the same lens varies every day. Now as it is a most important matter to ascertain the exact focus of every lens, M. Claudet and Mr. Knight have each devised an apparatus for ascertaining this with precision. M. Claudet's apparatus*. This consists of a series of screens having some black lines on them placed at different distances from each other round a circular piece of wood; this apparatus is placed opposite to the camera, and the lens adjusted until one, say the centre, is clearly defined on the ground glass; an impression is then taken, when probably the one most clearly defined on the ground glass will be most indistinct, and a screen some inches behind will be clearly impressed, the distance between these two will give the difference between the visual and chemical focus. Mr. Knight's apparatus is represented at fig. 32* and is extremely simple and portable; it consists of a brass frame, which is attached to the camera in the place of the ground glass; there are two grooves, one vertical, in which is placed the ground glass, and the other at an angle cutting the vertical one in the centre. After having obtained the focus upon the ground glass it is removed, and the plate introduced in the inclined groove, and an image is impressed of a large newspaper. Now, if the chemical and visual focus agree precisely, the writing will be the most distinct in the centre where it cuts the vertical groove in which the ground glass was placed; but if the two foci do not agree, some other parts of the plate will have the most distinct image. If the chemical focus be longer than the visual, the most distinct image will be on that part of the plate inclining away from the lens, and at some part of the plate corresponding with the amount of error; this amount can be read off in decimal parts of an inch by means of a scale at the side of the brass frame, and after having accurately obtained this distance, it is easy afterwards to move the tube containing the lense in or out a distance corresponding to the division of the scale indicating the deviation of the true from the photogenic focus.

63. A mirror for reversing the sides of the image, and to be fitted on to the end of the object-glass is necessary when we wish the objects represented to appear in the same position as they do naturally; thus if we point the camera at a man writing, in the representation his pen will appear to be held in the left hand, but if the mirror be used, the sides will be reversed and the pen appear in the right; a glass prism is sometimes used for this purpose, but it is very much more expensive and difficult to obtain perfect and free from striæ; it is true there are two reflections, and, therefore, two images formed on the ground glass by the mirror, one image being formed by reflection from the surface of the mercury at the back of the glass, and the other a faint image from the surface of the glass, but, practicably, this is of little importance, for the latter image is seldom of sufficient intensity to impress the plate. When the mirror is used, it lengthens the time of exposure of the plate about one-half as much again.†

64. The most beautiful form for the camera stand is that made by Mr. Allen, an engraving of which is given as a frontispiece to our present number.

In order to obtain an image on the prepared plate, the camera is placed on the stand opposite to the object, an image of which will be formed on the ground glass more or less distinct; the lens should then be moved by the rack and pinion to or

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* See Phot. Art-Jour. Vol. 2, pages 44 and 45 for illustration of this apparatus.

* See Phot. Art-Journal Vol. 2, page 45, 46.

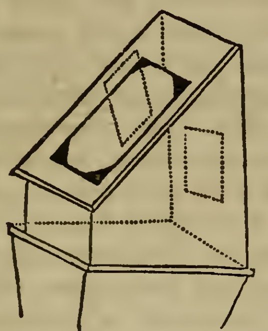
† Mr. Armitage of Louth, has for some time used a metallic speculum instead of a mirror, in order effectually to get rid of the double reflection. We have seen some extremely sharp and clear pictures produced by this means.

These metalic mirrors have long been in use among daguerreotypists in the United States.—*Ed. Phot. Art-Jour.*

from the ground glass until a clear image is obtained. The glass is then removed and the frame containing the plate introduced in its place, the slide is next withdrawn and the light allowed to act upon the prepared surface, the proper time for the light to act upon the plate depends upon so many circumstances, the hour of the day, the season of the year, and the preparation of the plate, that it is impossible to give any rule; but the time, with a good lense, a bright day, and a properly prepared plate, in the open air, ought not to exceed ten or fifteen seconds; after the proper time has elapsed the frame should be closed, the plate taken out of the camera, and submitted to the next operation, namely, bringing out the picture by the vapor of mercury, for if the plate is examined after the necessary action of light, no picture will be perceived.

We come now to the fourth operation, rendering the impression obtained in the camera visible by the aid of mercury.

Fig. 2.



65. Fig. 2 represents an apparatus for this purpose. The box is made of wood of the form represented in the figure. The bottom is of iron, slightly dished in the centre; this is for containing a small quantity of mercury, the bulb of a thermometer indicates the temperature obtained. The plates are supported in a groove, placed for this purpose inside the lid; this process is generally carried on in a dark room, but the box may be so contrived as not to render this necessary, the dark frame fitting the camera and containing the plate being made so as to adapt itself to the top of the mercury box, so that when placed in it, the slide may be withdrawn as in the camera. When required to be very portable, the legs are made to fold beneath the box, the plate may be examined from time to time by raising the lid and allowing a light from a bull's-eye lantern to fall upon the plate for a short time.*

66. The plate should be allowed to remain in the mercury-box until the picture is fully developed, or until it will take up no more mercury. This is readily seen; for when the picture has been in the mercury-box too long, the shadows begin to turn grey, and are covered with very minute particles of mercury. The proper time for the plate to be removed is just before this effect takes place. It is better to allow the plate to remain over the mercury as long as possible; for by so doing the picture acquires a more clear and white appearance. Should there be any small trace of solarization, a prolonged exposure to the mercury will sometimes remove it. The heat to be applied to the mercury-box should not exceed 100° Fahrenheit: it is better to bring out the picture at about 60° or 80°; it takes a little longer time, but there is less risk of spoiling the picture and it will be found that the details are generally better developed by employing a low heat. Should the mercury be made *too hot*, it will deposit itself in the deepest shadows, and spoil the proof.

68. A sand clock or timekeeper, for which we are indebted to Mr. Constable of Brighton, consists of a glass tube, 10 or 12 inches long, and about 1 in. diameter, half filled with fine sand, similar to that used for the ordinary minute glasses, and like them it has a diaphraghm with a small hole in the centre, through which the sand runs. The tube is attached to a board by a centre, on which it turns. On the upper portion of this board, and on one side, is a scale, graduated into minutes and seconds, provided with a moveable index. The instrument when in use is fixed firmly, and perfectly upright to the wall; the tube being revolved on its centre, the index is set to the number of minutes and seconds required to be marked. In practice, it will be found more convenient than a clock or seconds watch, and is applicable for

* It is convenient to tie up the mercury in a little bag and place it over the bulb of the thermometer.

The American mercury bath is a great improvement over the one here described; its form is too well known to need description.—*Ed. Phot. Art-Jour.*

either the mercury-box or bromine pan. (§ 31, 66.)

69. As the picture is brought out, or rendered visible by the mercury, it will be readily seen whether the plate has been exposed a sufficient time in the camera; for if those parts most illuminated only appear very distinctly, then we shall be certain it has been too short a time in the camera; but should it have been left the right period, the first effect of the mercury will develop the whole of the picture, but very faintly, and further mercurializing will develop it strongly. But if the plate has been too long exposed in the camera, it will have a blue appearance in those parts most illuminated by the sun, and if the exposure has been still longer, the lights and shades of the picture will be reversed. The blue appearance given by the too-prolonged action of light, is technically called "solarization."

70. There are several forms of mercury-box. The scale bath of the Messrs. Lewis is more universally used in the United States and is too well known to need description. It was the opinion of Daguerre that the mercurial vapor could only be properly applied to the plate at an angle of 45°, and mercury-boxes are still generally constructed for the plate to be held at this particular angle; but this is not of the slightest consequence, for a plate may be mercurialized in any position, and we have used a mercury-box made from an old plate-box, where the plates are held vertically. This form of mercury-box occupies very little space, and a number of plates can be mercurialized at once. The plates can be observed by drawing up the rod on the bottom of which each plate rests, or by having a piece of yellow glass in front of the box. All mercury-boxes should have stout iron bottoms. Some are made out of thin sheet iron: these retain the heat a very little time, and the operator has the trouble of heating them every few minutes. When made thick, they retain their temperature constant for some time when once heated, and a small flame may be allowed to burn under them without any danger of the bulb of the thermometer breaking. There is also an arrangement by which the mercury-box can be raised or lowered to or from the lamp until it is found that the temperature remains constant.

71. *5th Operation.—Removing the sensitive Coatings of Iodine and Bromine.*—Two or three porcelain vessels, a pair of plyers for small plates, Hyposulphite soda, and distilled water.

72. Having made a solution of hyposulphite of soda by dissolving about 1 oz. of the salt in a pint of distilled water, a small quantity should be poured into one of the procelain dishes, and the plate suddenly immersed with its face upwards, the whole of the colored coating of iodine and bromine will be promptly removed. The plate is then taken out, and placed in a vessel of distilled water until the next and final operation. On removing the plate from the mercury-box, it should be kept in the dark until the sensitive coatings are removed, as the light darkens them, and renders the operation more difficult.

73. Sixth and last process, viz.—Fixing the picture by means of a coating of gold, and drying the plate. The only apparatus required for depositing the film of gold on the plate is a levelling stand and a small glass funnel; some hyposulphite of gold, or crystallized chloride of gold, and hyposulphite of soda and distilled water.

To be Continued.

GOSSIP.

WE think that the Photographic art is scarcely sufficiently appreciated by our artists in general, as to its bearing and influence on the fine arts. It is certainly destined to work a revolution in every branch that will be most seriously felt, and there are no branches that will feel it so much as those of lithography and engraving. Photography upon paper has already made rapid strides towards perfection, and as it progresses throws into the shade lithography. In fact it has already attained a degree of excellence unapproachable by even the finest line engraving; for, while the whole details of a picture are quite equal to the most beautiful efforts of the engraver, the accessories are much more perfect, and they, at the same time, possess a softness of tone, and a harmonious blending of lights and shades, tints, and demitints, impossible to produce upon steel.

They are also more true to nature. The most minute objects—which it would be folly for a painter to attempt to introduce in a painting—are exquisitely developed in a photograph. Even those undistinguishable to the naked eye, may be detected by the use of a magnifying glass so perfectly wrought out upon the paper by the camera that the mind is lost in amazement at the wonderful workings of nature.

Contemplate for a moment these facts, and then consider the vast fields of natural objects, monuments of man's handiwork, and the ruins of ancient times, that may be reproduced in miniature upon paper without losing the slightest and most insignificant detail, portions that the finest pointed pencil would fail to sketch even the one-thousandth part, and which, by means of photography and the magnifying glass, may be brought to perfect view, and how vast the subject must appear.

There is a great want of appreciation of these facts on the part of our Daguerrean artists, and before they are aware of it another class of Photographers will spring up in the United States that will render their business of secondary importance, and its energies prostrate. The progress of improvement in all branches of the arts, sciences, and mechanics is continually onward, and it would be folly for us to suppose that the art of Photography is to be an exception to this general law. In fact, we have placed before us, almost daily, evidences to the contrary, and we are convinced that the silver plate must eventually give way to paper in photographic manipulation. In our opinion, and in that of every one to whom we have shown the specimens of paper photographs by M. Renard of Paris, which we have in our possession, their superiority over the daguerreotype is undeniable. There is such a freshness, clearness and softness, that commends them both to the good taste and admiration of every true lover of art.

The great difficulty which has hitherto existed, in the slowness of development in the camera, is now entirely dissipated, and the living model may be almost as quickly developed on paper in the camera as upon plates.

We are not, however, of the opinion expressed by many of the French philosophers, that the daguerreotype has arrived at its ultimate state of perfection. There is much room for improvement, both in the regular manipulation and in the manipula-

tors, and the first object to be obtained is that of the latter. No one will deny that the majority of our Daguerrean artists are men very incompetent to practice with any degree of success the process they have chosen as a means of livelihood, and these men must either improve themselves or leave the business to others who are daily entering their field of operation with more taste, natural genius and better education to recommend them to the public, and they must of necessity in the end become the most successful, not only in an artistic but pecuniary point of view.

These men are not satisfied with a mere mechanical skill in daguerreotyping, but they are ever searching out the causes of failure, and the methods of prevention. They are liberal patrons of the works devoted to their art, and although many of them stand on the highest pinacle of success, they are not so egotistical as to suppose that they cannot still be taught a few more practical truths, by others. They also see wherein others have failed, and they devote much of their time to the correction of the evil. These men must eventually drive out those whose bad taste, ignorance and egotism are continually exposing them to the comments of the more enlightened portion of the communities in which they live.

The taste of the public is every day improving in regard to daguerreotyping as well as to painting, engraving, and other branches of the arts, and consequently the ignorance, and unskillfulness of the blacksmiths and cowboys so often to be met with among daguerreotypists will become more and more prominent, and one by one they will, as now, resolve themselves back again into their more appropriate spheres.

We know that the majority of people now a days are excessively ignorant on the subject of daguerreotype pictures, and quite incapable of judging both as to their merits as likenesses, their tone, correct drawing' or artistic finish ; but we canno t agree with many of our artists that it is impossible to correct their tastes or judgment, and that they must of necessity permit pictures, in such hands, to leave their galleries, that they know are imperfect, and of which they would be ashamed to acknowledge themselves the authors to those fully capable of appreciating good work.

We contend that it is the same with daguerreotype pictures as it is with paintings. What painter, from the earliest master, down to the present day, who has gained a high reputation for his masterly skill in portraiture or landscape, would have been or would be willing to risk that reputation by the sale of an inferior picture merely for the purpose of tickling the vanity or subserving the bad judgment of his sitter? Not one! No, it is only the dauber, or the unknown, who would thus prostitute his noble art—none but those who, because they could form something in the shape of a human face upon a sign board, and have it distinguished as such, without scrawling underneath, " this is a portrait," imagine themselves artists, but whose imaginations carry them far beyond the limits of truth.

In the same position, do we say, stands the Daguerrean artists. Let him exercise his own judgment and taste, and if they be good and deserving of a high reputation he will obtain it from all who are capable of appreciating true talent. This once obtained, and he need not fear the necessity of allowing inferior works of his hands to cause him mortification.

The artist should always lead the taste of his patrons, not his be led by theirs. In the former case he is always the gainer ; in the latter the loser, for it is the natural bent of mankind to seek out, in every branch of art, those whose reputation for excellence is paramount, and this reputa-

tion must be established by those who are well known as perfect *connoiseurs* in the particular branch in which the devotee is engaged.

This argument is not wanting in facts to prove its correctness. We meet them in every day life, and in all branches of business, from the bootblack up to the noble sculptor. How many will pass by the little shop of a retail confectioner, to enter the palace like saloon of the Thompson's, and yet these same enterprising men once occupied quite as humble a shop as their neighbor. Why is it, therefore, that he now is so sought after? Simply because he has established a reputation—and one too justly earned—for excellence in his line. No one will deny that there are many who patronise him merely because of that reputation, but who are wholly incapable by their own tastes of judging his merits. Just so is it with the hatter, the tailor, the shoemaker, the carpenter, the cabinet maker, the lawyer, the physician, the daguerreotypist, the painter and the sculptor.

It is false reasoning to attribute to the mass of the people a desire to patronize those who sell cheap. It is true, there are many who do so, but they are by no means the largest class. We have ourselves been led on several occasions to try this course, and our own experience proves that this class pay "dear for their whistle," for we never purchased a "*cheap article*" that was worth the money paid for it. No, a fair price, not a "*cheap*" one is the true policy in all cases, and doubly so when dealing with a man of worth and integrity. We will ask, does not this argument hold good in every branch of the daguerreotype business? How much does an artist save by purchasing "*cheap*" materials? Is there an artist who can assert that the quality of a *cheap* daguerreotype both as regards the picture, and the manner of putting it up, is equal to one for which he obtains a higher price? It must be conceded that we know something about this matter, and speak from experience, and will answer the question in the negative—No.

On the road to distinction or fortune, a good reputation is every thing. Energy will do much, but its course may be directed wrongfully, and it can be made productive of profitable results only when allied to an unquestionable high reputation in the art. We know that there are always exceptions to every rule, but there are, comparatively, very few to this. Sometimes we see a man of shallow intellect rise from poverty's door, to great wealth, and knowing his circumstances, we are apt to judge harshly of his character and attribute his rise to dealings of a disreputable nature, when, perhaps, if we examined deeper into the matter, we might ascertain that his rise is entirely owing to his fitness for the peculiar business by which he made his fortune.

No one ever knew an imbecile to get rich, and we do not think that many rogues ever did so by the practice of their base designs. We hold to the opinion that wealthy men are more sinned against than sinning, merely because the mind of man is too much carried away by envy, and is too superficial in its examination of this matter. In all our experience we never knew a villain to die rich; but we would not have it supposed that because we thus reason we believe, *per contra*, that all poor men are dishonest, for generally speaking, honesty is the poor man's inheritance. No, we think that eminence in his art or profession, allied to energy of character is the only true road to success for any man.

It may be thought that we have digressed considerably from the subject of our first remarks, but we have not. Our remarks are all intended to prove the great

necessity for improvement in Daguerrean artists, particularly mental. Taste is a principle inherent in man, but may be more or less cultivated, according to the capacity of the mind. Without refined taste for the arts it is as impossible to appreciate the exquisite results of a master workman, as it is to enjoy a good dinner during a bilious attack.

How can taste be acquired? may be asked. We answer, by the instructions of those whose judgments are acknowledged to be perfect, and by the study of works of art of unblemished superiority. When an artist has done this he is in a greater or less degree capable of instructing others.

That the artist can lead the tastes of his patrons to a due appreciation of his best efforts might be abundantly illustrated by anecdotes. We will content ourselves with one or two and then close the subject for the present.

Quite a respectable looking man once called upon a friend of ours to have his daguerreotype taken. He was requested to take his seat, but in doing so placed himself in a very awkward position. The operator desired to alter it but he refused, and on the request being urged became angry, and insisted that he knew how to sit better than any one could teach him. "Very well," said the artist; "as you please." The picture was taken, and the artist walked up to the gentleman in a very quite manner, presented it to him, and remarked in a very decided tone, "There you are sir, just as awkward as you appeared."

The gentleman glanced at it and replied, "you are right sir; you know more about it than I do; will you be kind enough totake another, and sit me as you please."

Of course his request was granted, and he took away with him a picture which neither he nor the artist would be ashamed to have shown the most critical.

In another instance, a gentleman found fault with his daguerreotype because it did not suit him as to the likeness, tone, and price, asserting that he could get better for half the money. Upon the Daguerreotypist censuring him for his conduct, high words arose, which might have resulted in a serious quarrel, had not the artist acted perfectly independent as to his taking the picture or not. The result, however, was that he bought it, at the same time declaring that it was the best picture he had ever had taken of himself, and that no sum of money could induce him to part with it.

— We wish we could induce more of our talented Daguerreans to contribute their experience to their brother artists through our Journal. It would certainly be conducive to the welfare of all, both to the giver and recipient. While the latter would be, in all probability, instructed in points that are perplexing to them, the former would beget more confidence in the public mind. It is often a matter of remark among the more intelligent portion of the people, that there are so few among Daguerreans who are either willing or capable of writing upon the subject of their art.

Mr. Hesler, in his communication to the present number of the journal, speaks the sentiments of the true artist, and his complaints and censure are too true and just to be suffered to pass unnoticed. We trust, therefore, that they will be generously responded to by all of our subscribers, and his example freely followed.

— We cannot fully answer the questions of our friends D. & H. in regard to the disposition of the Hillotype, "if it ever does prove a reality," as we are not in the confidence of Mr. Hill. We have understood from various sources, that he has

been issuing circulars to Daguerreans the more distant portions of the Un ted States, asserting that he is now ready to dispose of rights for the use of his discovery, and give instructions in its manipulations to those to whom the circular is sent. We have also been told that he has selected certain persons who are only to receive its benefits, and that all the others "*will be glad in a few weeks, to crawl on their hands and knees*" to the footstool of Mr. Hill and beg for forgiveness. This latter expression was made to us by one who asserts that he is to have the exclusive right for Rochester, N. Y. We cannot think these things are true, if Mr. Hill has really made the alleged discovery. If they are, then is he perfectly devoid of that integrity for which we have given him credit, for we have his solemn promise, more than once made public, that he was opposed to this very course and should pursue that directly opposite, enabling every one who chooses to become a participant. We do not think D. & H. need be alarmed, or entertain the idea for a moment that they will have to "crawl" for any favors; their characters as men and artists are too well founded to suffer from any disposition that may be made of the invention. They may depend upon it, that if they ever desire it, it will not be refused.

— A gentleman in Charleston, is said to have made a valuable discovery in the art of Daguerreotyping. The advantage claimed for a picture taken by the new process is, that it requires no glass to protect it, inasmuch as it is covered with a transparent enameled surface, which renders the picture impervious to the effects of the atmosphere, and less liable to be rubbed off; in fact the more friction that is used on the surface, the brighter and clearer the picture becomes, and so durable is it that it can be sent in a letter any distance, without the possibility of its being scratched or defaced.—*Tribune.*

From a description we have had of this process we should judge that it is an old process revived, and that the gentleman paid "too dear for the whistle," when he bought it.

— We clip the following from the *Jeffersonian*, of Galena:

"HESLER'S DAGUERREOTYPES.—By a constant devotion to his profession, our friend Hesler, of this city, who has already a wide celebrity as a Daguerrean Artist, has achieved a new triumph, that, while it will add to the reputation of the discoverer, confers a lasting benefit on those who resort to the Daguerreotype, for "counterfeit presentment" of themselves or their friends. The merit of the discovery consists in a heretofore unknown process, by which the silvered plate is deprived of its metallic lustre—substituting therefor, a rich and mellow ivory color, contrasting admirably with the dark shades of the image, which seems to stand out in relief from the highly polished surface.

"Specimens of pictures by the new process, are at his door; and we venture to say that Main street offers no more attractive sight than those exquisite specimens of his skill."

— ALLEN'S IMPROVED CAMERA STAND.—We give our readers this month an engraving of this truly elegant article. It suitable both for the half, whole or double whole size camera box. We consider the manner of elevating the top, by means o the screw and wheel, though simple, to be the very best that could be used. It was first applied by Mr. Davie of Utica, and will undoubtedly be preferred by the majority of our artists. The base and column are both, as will be seen by the engraving, elaborately and exquisitely ornamented, and would be an ornament even in a parlor. The diameter of the base is two feet six inches, and the heighth of the column two feet three inches. We commend this

stand to the consideration of our artists generally. Mr. Allen will also furnish the castings of this stand to cabinet makers on reasonable terms. We do not consider it necessary to give a minute description of this stand, as every artist is familiar with the various points constituting that article, and as the excellent engraving will give at a glance a perfect idea of its beauty and superiority.

— A Daguerrean artist, who is one of our subscribers, wishes to construct a travelling saloon, in such a manner that it may be folded within itself when not in use, be sufficiently light to be drawn by one horse, and yet large enough for all the purposes of his art, when unfolded and extended. He desires us to request the publication of the views of such of our subscribers as feel disposed to favor him with their assistance. He is willing to remunerate the inventor of the most approved plan in a suitable manner.

— Since writing the above we have received the following letter from the gentleman alluded to.

Traveling Daguerreotype Wagon.

To the Editor of the Pho. Art-Joarnal.

Dear Sir,—Though the Photographic Art-Journal is devoted to improvements of general utility in the art, perhaps the present subject from its connection may be worthy of consideration to many Daguerreotypists.

I am, and I have been for some time, as you are aware, traveling about with a large Daguerreotype saloon. I find it inconvenient, expensive, and in some respects, ill-adapted to its purpose. It is large, heavy and cumbersome, requiring four strong horses to move it. I hire these horses from place to place, sometimes with more or less difficulty or expense. I have thought it practicable and desirable to build a Daguerreotype Saloon of such *materials* and *dimensions* that one strong horse could draw it over all tolerably good roads. And I am now willing to do so. But as in union there is strength, so I may be greatly benefitted and aided, if, instead of building upon my own plans I first obtain the collective wisdom of those who have already had experience, or thought upon the subject.

I therefore request from all those Daguerreotypists who may be willing to give the subject some little consideration, *some plan or idea* of how they would build the wagon I desire. By their united assistance I could build one every way well adapted to its purpose.

To each individual who shall so favor me, I offer a drawing, lithographic or otherwise, fully explanatory of my wagon when completed.

It must be large enough when opened and stationary to operate in, with seats for customers, work-bench, dark-room, stove, sink, sky-light, &c. &c. It must of course be waterproof, and secured as much as possible from changes of temperature or gales of wind.

If it be asked what advantages I propose by such a wagon, I answer, that by keeping my own horse I can move about more independently and with greater activity than with a large one requiring four hired horses. I can reap harvests at places too small to be visited by my present saloon. These harvests are rich and rapidly gathered,—few or no reapers have visited their localities.

Any plan, or combination of plans, then that would offer most advantages and give a wagon that could be moved with one horse on common roads, while from publicity it increased the demand for Daguerreoptypes in general, would be a desideratum to me and others who may wish to carry the art where it is yet but little known.—Yours, respectfully,

Helia.

Gentlemen desirous of favoring me with their communications on the subject will please address, Helia, care of Mr. H. H. Snelling, 308 Broadway, New York.

— We perceive that the Brothers Davie of Utica are doing a fine business, notwithstanding they did not receive the award at the Mechanic's Fair. Mr.

Johnson their competitor takes fine pictures; they are very clear and bold, but they are wanting in that exquisite softness, warmth of tone and artistic blending of the shades, demi-tints and lights, which characterise those of the Messrs. Davie. The success of the latter gentlemen evinces that they are properly appreciated.

— The following characteristic letter should serve as a stimulant to the lukewarm Daguerreans of the United States.

Bogota, S. A., *January*, 23, 1852.

H. H. Snelling, Esq.

Dear Sir,—By an article in your excellent "Photographic Art-Journal" of October 1851, which has just come to hand, I see the "State Daguerrean Association" has resolved to erect a monument to the memory of the immortal Daguerre; that I heartily approve of this "resolve" on the part of this Association, must be evident, to those at least, who are aware that for the last ten years I have practised the art which Daguerre first presented to the world, and I wish to contribute my mite toward the erection of a monument to the memory of the man whose genius has done so much for art, and my own enjoyment; then do me the favor to say to Mr. P. Haas,—of your city,—that I will pay thirty dollars as a subscription, and *double* it in case of *necessity*

I regret that my time has been so much occupied, since my return, that I have not been able to comply with a promise made you in New York, of becoming a contributor to your "Journal." So far as I am concerned, I have no secrets of a professional character, that I am not willing to lay before the profession, and shall be happy to do so!

The "fifty cent" and "dollar portraits" of New York have often made me ashamed of my employment, and I am truly rejoiced to see (by your monthly) that several organizations have come into existence recently, whose objects appear to be, the elevation of our glorious profession to the destination intended, by its author the God of light. Yours, very truly,

J. A. Bennet.

— Mr. Gurney, of this city, has added to his extensive gallery of daguerreotypes Mr. R. H. Vance's splendid f scenes in California. We have already spoken of this collection, in a former number. They certainly surpass any thing of the kind ever exhibited in this or any other country, and while we regret that they were not properly appreciated while in the hands of Mr. Vance, we trust that they will attract many visitors to Mr Gurney's rooms.

— We were shown, a few days since, by Mr. Black, three daguerreotypes, by Mr. Whipple of Boston, taken with the aid of the Drummond light at night. They are very good, much better than a great many daylight pictures. The outlines are very strong and dark, giving great boldness to the figure, but they are wanting in softness of tone and expression, and do not possess sufficient gradations of light and shade. From these specimens, however, we should judge that it is possible to modify these defects.

— Messrs. Davis & Perry have opened rooms at 257 Washington street, Boston, that are said to be truly magnificent. We are well acquainted with Mr. Perry, and know him to be one of the best Daguerreotypists in the United States. He has a fine taste, excellent judgment in his art, and executes admirable pictures. He will undoubtedly command a large share of the patronage of so critical a city as Boston.

— Mr. Brinkerhoff has opened a very fine suit of rooms on the corner of Broadway and White-street. We have not seen any of his pictures as yet, but we believe he is considered a good artist.

— We can give J— no information in regard to the matter. We have not seen any thing of it since the 15th of December. He must enquire elsewhere. All we have to say is, that if his suggestion proves correct we shall be sorry for it.

— Mr. Lawrence is preparing to take daguerreotypes on plates 13 × 17 inches in size. When completed they will be the largest in the world.

— SUBSCRIPTIONS TO THE MONUMENT TO DAGUERRE at Paris, received since our last, by the Messrs. Mead Brothers—

G. K. Warren, of Lowell, Mass.	10 fr.
James Bunn, New York city,	27 "

— We cordially recommend the following note to the favorable consideration of our friends, who may desire, for the purposes of business or pleasure, to possess a convenient and economical carriage. We will receive subscriptions, as requested.

To Traveling Daguerreans.

I propose to contract for the exclusive use, in particular places or routes of a new invention of mine, during the time when its novelty will make it serviceable by attracting general notice to itself and to whatever business is connected with it. It is a steam carriage. It may be built of a size to suit a daguerrean operator to take pictures in; it may be kept warm by the waste steam, without expense while running, and with little expense while standing; it can be managed by one person, with less trouble than a horse; and it may be worked twelve hours or more without stopping, except for water or fuel, unless the fuel contain impurities such as slate, or matter to form clinkers; and the labor of keeping it in order will be less that that of taking care of a horse upon the road. The current expense of running it will be within one cent per mile, on common roads, if the weight do not exceed a ton. The first cost of machinery will be about $700, and that of the carriage from $400 upwards; $1500 would probable fit up a very commodious carriage, with all the conveniences required by an operator. As to repairs, I cannot speak with certainty; but I can give a good guarantee that the total expense of running and repairs shall be less than the keeping of a horse running at the same speed.

Those who would like to possess such a carriage are invited to subscribe as much as they please. As soon as $1500 is subscribed, or $1000 if more cannot be obtained, the subscribers will draw lots for the amount; and the winner will have the carriage made to suit him. Mr. H. H. Snelling, proprietor of this Journal will receive subscriptions; and act as agent for subscribers at a distance.

J. K. FISHER,
179 Boradway, N. Y.

— We make the following extract from the letter of a valued subscriber in Houston, Texas:

" You will doubt less haveheard from higher authorities than myself that your work is increasing in intensity of interest—practical papers such as those of Mr. Hesler & Dr. Dorat with such perfect freedom from any tint of empiricism, and scientific communications from Hunt and Claudet (personal acquaintances of mine 8 years since in England)—together with your translation from "La Lumiere" cannot fail to have a beneficial influence on all who peruse them and to induce enquiries as to the philosophy of the principles involved in so interesting and beautiful an art. Heliography on both glass and paper, especially the former, are both destined I believe to effect a greater revolution in genuine taste for art in this country than is generally anticipated—and I trust that your facilities for acquiring the contributions of Macaire and Bacot, Fox Talbot, Hunt, Bingham end Malone—will, to as great an extent as possible, be made available."

Yours, truly,
J. H. S. STANLEY.

ALLEN'S IMPROVED CAMERA BOX.

Engraved expressly for the Photographic Art Journal

THE

PHOTOGRAPHIC ART-JOURNAL.

Vol. 3. ARRIL, 1852. No. 4.

THE POETRY OF SCIENCE, OR STUDIES OF THE PHYSICAL PHENOMENA OF NATURE.*

BY ROBERT HUNT,
Author of 'Panthea,' 'Researches on Light,' etc.

UNDER the force we have been considering, acting as so many contending armies, matter passes from one condition to another, and what is now a living and a breathing creature, or a delicate and sweetly scented flower, has been a portion of the amorphous mass which once lay in the darkness of the deep ocean, and it will again, in the progress of time, pass into that condition where no evidences of organization can be found,—again, perhaps, to arise clothed with more exalted powers than even man enjoys.

When man places himself in contrast with the Intelligences beyond him, he feels his weakness; and the extent of power which he can discover at work, guided by a mysterious law, is such, that he is dwarfed by its immensity. But looking on the past, surveying the progress of matter through the inorganic forms up to the higher organizations, until at length man stands revealed as the chief figure in the foreground of the picture, the monarch of a world on which such elaborate care has been bestowed, and the absolute ruler of all things around him, he rises like a giant in the conscious strength of his far searching mind. That so great, so noble a being should suffer himself to be degraded by the sensualities of life to a level with the creeping things, upon which he has the power to tread, is a lamentable spectacle, over which angels must weep.

The curious connection between the superstitions of races, the traditionary tales of remote tribes, and the developments of the truths of science, are often of a marked character, and they cannot but be regarded as instructive. In the wonders of "olden time" fiction has ever delighted; and a thousand pictures have been produced of a period when beings lived and breathed upon the earth which have no existence now.

Hydras, harpies, and sea-monsters figure in the myths of antiquity. In the mythology of the northern races of Europe we have fiery flying dragons, and poetry has placed these as the guardians of the "hoarded spirit," and protectors of the enchanted gold.

Through the whole of the romance period of European literature, nothing figures but serpents, "white and red," toiling and fighting under ground,—thus producing earthquakes, as in the story of Merlin and the building of Stonehenge; and flying monsters, griffins and others, which now live only in the meaningless embellishments of heraldry. Curious it is, too, to find the same class of ideas prevailing in the East;—the monster dragons of the Chinese, blazoned on their standards and ornamenting their temples;—the Buddaical superstition that the world is supported on a vast elephant, which stands on the back of a tortoise, which again rests on a serpent,

* Continued from vol. 3, No. 3, p. 133.

whose movements produce earthquakes and violent convulsions; the rude decorations also of the temples of the Aztecs, which have been so recently restored to our knowledge by the adventurous travellers of Central America,—all give expression to the same mythological idea.

Do not all these indicate a faint and shadowy knowledge of a previous state of organic existance? The process of communion between man of the present, and the creations of a former world, we know not; it is mysterious, and forever lost to us. But even the most ignorant and uncultivated races of mankind have figured for themselves the images of creatures which, whilst they do really bear some resemblance to things which have forever passed away, do not, in the remotest degree, partake of any of the peculiarities of existing creations.

The ichthyosaurus, and the plesiosaurus, and the pterodactylus, are preserved in the rude images of harpies, of dragons, and of griffins; and although the idea of an elephant standing on the back of a tortoise was often laughed at as an absurdity, Captain Cautly and Dr. Falconer at length discovered in the hills of Asia, the remains of a tortoise in a fossil state of such a size that an elephant could easily have performed the feat.

Of the ammonites, we have more exact evidence; they were observed by our forefathers, and called by them snake-stones; and according to the legends of Catholic saints they were considered by them as possessing a sacred character:—

> "Of these and snakes, each one
> Was changed into a coil of stone
> When holy Hilda prayed."

And in addition to this petrifying process, one of decapitation is said to have been effected; hence the reason why these snake-stones have no heads.

We also find, in the northern districts of our island, that the name of "St. Cuthbert's beads" is applied to the fossil remains of encrinites.

Thus we learn that to a great extent fiction is dependent upon truth for its creations; and we see that when we come to investigate any wide-spread popular superstition, although much distorted by the medium of error through which it has passed, it is frequently founded upon some fragmentary truth. There are floating in the minds of men certain ideas which are not the result of any associations drawn from things around; we reckon them amongst the mysteries of our being. May they not be the truths of a former world, of which we receive the dim outshadowing in the present, like the faint lights of a distant Pharos seen through the mists of the wide ocean?

Man treads upon the wreck of antiquity. In times which are so long past, that the years between them cannot be numbered by the aids of our science, geology teaches us that forms of life existed perfectly fitted for the conditions of the period These performed their offices in the great work; they passed away, and others succeeded to carry on the process of building a world for man. The past preaches to the present, and from its marvellous discourses we venture to infer something of the yet unveiled future. The forces which have worked still labor: the phenomena which they have produced will be repeated.

> Ages on ages slowly pass away,
> And nature marks their progress by decay.
> The plant which decks the mountain with its bloom
> Finds in the earth, ere long, a wasting tomb:
> And man—the great, the generous, and the brave—
> Seeks in the soil, at last, a silent grave.
> The chosen labors of his teeming mind
> Fade with the light, and crumble with the wind;
> And e'en the hills, whose tops appear to shroud
> Their granite peaks deep in the vapory cloud,
> Melt slowly down to fill th' extended plains,
> Worn by the breezes—wasted by the rains.
> Earth sinks in ocean—seas o'erwhelm the land;
> But 'neath the powers of the empyreal band—
> Who, ever working at creation's wheel,
> From the rude wrecks of matter still reveal
> Forms of excelling beauty—earth will rise
> Pure as the flames from love's own sacrifice,
> And, beaming with the brightest smile of youth,
> Proclaim mutation as the eternal truth.

CHAPTER XIV.

PHENOMENA OF VEGETABLE LIFE.

Psychology of Flowers—Progress of Matter towards Organization—Vital force—Spontaneous Generation—The Vegetable Cell—Simplest Development of Organization—The Crystal and the Cell—Primitive Germ—Progress of Vegetation—Influence of Light—Morphology—Germination—Production of Woody Fibre—Leaves—Chlorophylle—Decomposition of Carbonic Acid—Influence of Light, Heat, and Actinism on the Phenomena of Vegetable Life—Flowers and Fruits—Etiolation—Changes in the Sun's Rays with the Seasons—Distribution of Plants—Electrical and Combined Physical Powers.

THE variety of beautiful forms which cover

over the surface of this sphere serve, beyond the physical purposes to which we have already alluded, to influence the mind, and give character to the inhabitants of every locality. There are men who appear to be dead to the mild influences of flowers; but these sweet blossoms—the stars of our earth—exert a power as diffusive as their pervading odors.

The poet tells us of a man to whom

> The primrose on the river's brim
> A yellow primrose was to him,
> And it was nothing more.

But it was something more. He, perhaps, attended not to the eloquent teaching of its pure, pale leaves; he might not have been conscious of the mysterious singing of that lowly flower; he might, perchance, have crushed it beneath his rude foot rather than quaff the draught of wisdom which it secreted in its cell; but the flower still ministered to that mere sensualist, and in its strange, tongueless manner, reproved his passions and kept him "a wiser and a better man," than if it had pleased God to have left the world without the lovely primrose.

The psychology of flowers has found many students—than whom not one read them more deeply than that wild spirit who sang of the Sensitive Plant, and in wondrous music foreshadowed his own melancholy fate.* That martyr to sensibility, Keats, who longed to feel the flowers growing above him, drew the strong inspiration of his volant muse from those delicate creations which exhibit the passage of inorganic matter into life; and other poets will have their sensibilities awakened by the æsthetics of flowers, and find a mirror of truth in the crystal dew-drop which clings so lovingly to the purple violet.

If we examine carefully all the conditions of matter which we have made the subject of our studies, we cannot but perceive how gradual is the progress of the involved action of the physical forces, as we advance from the molecule—the mere particle of matter—up to the organic combination. At first, we detect only the action of cohesion in forming the rude mass; then we have the influence of the crystallogenic powers giving a remarkable regularity to bodies; we next discover the influences of heat and electrical force in determining condition, and of chemical action as controlled by them. Yet, still, we have a body without organization. Light exerts its mysterious powers; and the same elements assume an organized form; and in addition to the recognized agencies, we perceive others on which vitality evidently depends. These empyreal influences become more and more complicated to us: ascending in the scale, they rise beyond our science; and at length, we find them guiding the powers of intelligence, while instinct and reason are exhibited in immediate dependence upon them.

Let it not be imagined that this view has any tendency to materialism. The vital energy is regarded as a spiritualization, and reason as a divine emanation; but they are connected with materialities, on which they act, and by which they are themselves controlled. The organic combinations, and the physical powers by which these unions of matter are effected and retained, have a direct action over that etheriality which gives life, and the powers of life again control these more material forces. The spirit, in whatever state, when connected with matter, is like Prometheus chained to his rock, in a constant struggle to escape from his shackles, and assert the full power of its divine strength.

We have seen variety enough in the substances which make up the inorganic part of creation: but infinitely more varied are the forms of organization. In the vegetable world which is immediately around us, from the green slime of our marshes to the lustrous flowers of our gardens and the lordly trees of our forrest, what an extraordinary diversity of form is apparent! From the infusoria of an hour, to the gigantic elephant roaming in his greatness in the forests of Siam—the noble lion of the caves of Senegal—the mighty condor of the Andes—and onward to man, the monarch of them all, how vast are the differences, and yet how complete are they in their conditions! In the creation we have examined, we have had conclusive evidence that from the combination of atoms every peculiar form has been produced. In the creation we are about to examine, we shall discover that all the immense diversity of form, of color, and condition which is spread over the world in the vegetable and

* Percy Bysshe Shelley.

animal kingdoms, results from the combination of cells. The atom of inorganic nature becomes a cell in organic creation. This cell must be regarded as the compound radical of the chemist, and by decomposing it, we destroy the essential element of organization.

With the mysterious process by which the atom is converted into a cell, or a compound radical, we are unacquainted; but we must regard the cell as the organic atom. It is in vain that the chemist or the physiologist attempts to examine this change of the inorganic elements to an organized state; it is one of the mysteries of creation, which is to be, in all probability, hid from our eyes, until this "mortal coil" is shaken off, and we enjoy the full powers of intelligence in our immortal state.

Again and again has the attention of men been attracted to the *generatio æquivoca;* they have sometimes thought they have discovered a *generatio primitiva* or *spontanea;* but a more careful examination of these organisms has shown that an embryo existed—a real germination has taken place.

Count Rumford stated that threads of silk and wool had the power of decomposing carbonic acid in water in the sunshine; and hence, some have referred organization to a mere chemical change produced by luminous excitation; and we have heard of animal life resulting from pounded siliceous matter. All such statements must be regarded as evidences of imperfect investigation.

Dr. Carus, alluding to the experiments of Gruithuisen, Priestley, and Ingenhousz, says: "These show, more than any other experiments, that, in the purest water, under the influence of air, light, and heat, beings are formed, which, oscillating as it were between the animal aud the plant, exhibit the primitive germs of both kingdoms." Treviranus repeated, and appeared to confirm these results; but in these experiments we have no evidence that the germ did not previously exist in the spring-water which was employed.

Some have regarded the cell as a crystal; they see the crystal forming; by the accumulation of atoms, into a fixed form, under the influence of an "inner life;" and, advancing but a step, they regard the cell as the result of an increased exercise of the physical influences. We have referred crystalline form to certain magnetic conditions; and it is evident that every atom of the cell is influenced by similar conditions; but if we place a crystal in its natural fluid, though it increases in size, it never alters in form: whereas, if we place a cell in its natural position, it gives indications of motion, it unites with other cells and we have a development of organs which are in no respect the same in form as the original. From a vesical floating invisible to the unaided human sense in its womb of fluid, is produced a plant possessing strange powers, or an animal gifted with volition. The idea, that two kinds of polarity—light on one side, and gravitation on the other—produce the two peculiar developments of roots and branches, can only be regarded as one of those fanciful analogies which prove more imagination than philosophy.

The conditions are, however, most curious; they deserve very attentive study; but in examining the phenomena, the safest course is to allow the effects as they arise to interpret to us, and not admit the love of hypothesis to lead us into bewildering analogies; or uncertain phenomena to betray us to hasty inferences. It is of this evil that Bacon speaks, in his "Advancement of Learning." He says:—

"The root of this error, as of all others, is this, that men, in their contemplations of nature, are accustomed to make too timely a departure, and too remote a recess from experience and particulars, and have yielded and resigned themselves over to the fumes of their own fancies and popular argumentations."

Without venturing, therefore, to speculate on the origin of the primitive cell, or unit of vegetable life, which involves the problem of the metamorphosis of a rude mass—the primitive transformation of the rudimentary atoms into organic form—we must admit that the highly organized plant is but an aggregation of these cells; their arrangement being dependent upon certain properties peculiar to them, and the exercise of forces such as we have been studying,—all of which appear to act externally to the plant itself.

Experiments have been brought forward in which it appeared that, after all organization which could by any possibility exist

had been destroyed by the action of fire, solutions of flint and metallic salts have, under the influence of electric currents, exhibited signs of organic formation, and that, indeed, insects —a species of acari— have been developed in them. The experiments were made with care, and many precautions taken to cut off all chances of any error, but not all the precautions required in a matter of such exceeding delicacy ; and we are bound not to receive the evidence yet afforded as the true expression of a fact without much further investigation. All experience, setting aside the experiment named, is against the supposition that pounded or dissolved flint could by any artificial means be awakened into life. Ova may have been conveyed into the vessels which contained the solutions under experiment ; and in due time, although possibly quickened by electric excitation, the animals—the most common of insects—came into existence.

The rapid growth of confervæ upon water has often been brought forward as evidence of a spontaneous generation, or the conversion of inorganic elements into organic forms ; but it has been most satisfactorily proved that the germ must be present, otherwise no evidence of anything like organization will be developed. All the conditions required for the production of vegetable life appear to show that it is quite impossible for any kind of plant, even the very lowest in the scale, to be formed in any other way than from the embryo in which are contained the elements necessary for it, and the arrangements required for various processes which are connected with its vitality.

The earth is now covered with vegetable life, but there must have existed a time when "darkness was upon the face of the deep," and organization had not yet commenced tracing its lovely network of cells upon the bare surface of the ocean-buried rock. At length the mystery of organic creation began : into this science dares not penetrate, but it is privileged to begin its search a little beyond this point, and we are enabled to trace the progress of organic development through a chain of interesting results which are constantly recurring.

If we take some water, rising from a subterranean spring, and expose it to sunshine, we shall see, after a few days, a curious formation of bubbles, and the gradual accumulation of green matter. At first, we cannot detect any marks of organization—it appears a slimy cloud of an irregular and undetermined form. It slowly aggregates, and forms a sort of mat over the surface, which at the same time assumes a darker green color. Careful examination will now show the original corpuscles involved in a network formed by slender threads, which are tubes of circulation, and may be traced from small points which we must regard as the compound atom, the vegetable unit. We must not forget, here, that we have to deal with four chemical elements, oxygen, hydrogen, carbon, and nitrogen, which compose the world of organized forms, and that the water affords us the two first as its constituent, gives us carbon in the form of carbonic acid dissolved in it, and that nitrogen is in the air surrounding it, and frequently mixed with it also.

Under the influence of the light, we have now seen these elements uniting into a mysterious bond, and the result is the formation of a cellular tissue, which posesses many of the functions of the noblest specimens of vegetable growth. But let us examine the progress. The bare surface of a rock rises above the waters covered over with this green slime, a mere veil of delicate net work, which, drying off, leaves no perceptible trace behind it ; but the basis of a mighty growth is there, and under solar influence, in the process of time, other changes occur.

After a period, if we examine the rock, we shall find upon its face little colored cups or lines with small hard disks. These at first sight, would not be taken for plants, but on close examination they will be found to be lichens. These minute vegetables shed their seed and die, and from their own remains a more numerous crop springs into life. After a few of these changes, a sufficient depth of soil is formed, upon which mosses begin to develope themselves, and give to the stone a second time a faint tint of green, a mere film still, but indicating the presence of a beautiful class of plants, which, under the microscope, exhibit in their leaves and flowers many points of singular elegance. These mosses, like the lichens, decaying, increase the film of soil, and

others of a larger growth supply their places, and run themselves the same round of growth and decay. By and by, funguses of various kinds mingle their little globes and umbrella-like forms. Season after season plants perish and add to the soil, which is at the same time increased in depth by the disintegration of the rock over which it is laid, the cohesion of particles being broken up by the operations of vegetable life. The minute seeds of the ferns floating on the breeze, now find a sufficient depth of earth for germination, and their beautiful fronds, eventually wave in loveliness to the passing winds.

Vegetable forms of a higher and a higher order gradually succeed each other, each series perishing in due season, and giving to the soil additional elements for the growth of plants of their own species or those of others. Flowering herbs find a genial home on the once bare rock ; and the primrose pale, the purple foxglove, or the gaudy poppy, open their flowers to the joy of light. The shrub, with its hardy roots interlaced through the soil, and binding the very stones, rich in its bright greenery. Eventually, the tree springs from the soil, and where once the tempest beat on the bare cold rock, is now the lordly and branching monarch of the forest with its thousand leaves, affording shelter from the storm for bird and beast.

Such are the conditions which prevail throughout nature in the progress of vegetable growth : the green matter gathering on a pond, the mildew accumulating on a shaded wall, being the commencement of a process which is to end in the deveopment of the giant trees of the forest, and the beautifully tinted flower of nature's most chosen spot.

We must now consider closely the phenomena connected with the growth of an individual plant, which will illustrate the operation of physical influences throughout the vegetable world. The process by which the embryo, secured in the seed, is developed is our first inquiry.

An apparently dead grain is placed in the soil. If the temperature is a few degrees above the freezing point, and holds a due quantity of water, the integument of the seed imbibes moisture and swells ; the tissue is softened, and the first effort of vital force begins. The seed has now the power of decomposing water, the oxygen combines with some of the carbon of the seed, and is expelled as carbonic acid. This part of the process is but little removed from the merely chemical changes which we have already considered. We find the starch of the seed changed into sugar which affords nutritive food for the developing embryo. The seed now lengthens downwards by the radicle, and upwards by the cotyledons, which, as they rise above the earth acquire a green color. Carbonic acid is no longer given off. These cotyledons, which are two opposite roundish leaves, act as the lungs ; by them carbonic acid is conveyed to the roots, it is carried by a circulating process now in full activity through the young plant, it is deprived of its carbon, and oxygen is exhaled from it. The plant at this period is little more than an arrangement of cellular tissue, a very slight development of vascular and fibrous tissue appearing as a cylinder lying in the centre of the sheath. At this point, however, we begin distinctly to trace the operations of a new power; the impulses of life are evident.

The young root is now lengthening, and absorbing from the moisture in the soil, which always contains some soluble salts, a portion of its nutriment, which is impelled upwards by a force—probably capillary attraction and endosmose action combined—to the point from which the plumule springs The plumule first ascends as a little twig, and, at the same time, by exerting a more energetic action on the carbonic acid than the cotyledons have done, the carbon retained by them being only so much as is necessary to form chlorophylle, or the green coloring matter of leaves, some wood is deposited in the centre of the radicle. From this time the process of lignification goes on through all the fabric,—the increase, and indeed the life, of the plant depending upon the development of a true leaf from the plumule.

It must not be imagined that the process consists, in the first place, of a mere oxidation of the carbon in the seed,—a slow combustion by which the spark of life is to be kindled ;—the hydrogen of the water plays an important part, and, combining also with the carbon, form necessary compounds, and by a secondary process gives rise again to water by com-

bination with oxygen in the cells of the germinating grain. Nor must we regard the second class of phenomena as mere mechanical processes for decomposing carbonic acid, but the result of the combined influences of all the physical powers and life superadded.

This elongating little twig, the plumule, at length unfolds itself, and the branch is metamorphosed into a leaf. The leaf aerates the sap it receives, effects the decomposition of the carbonic acid, the water, and in all probability the ammonia which it derives from the air, and thus returns to the pores, which communicate with the pneumatic arrangements of the plant, the necessary secretions for the formation of bark, wood, and the various proximate principles which it contains.

After the first formation of a leaf, others successively appear, all constructed alike and performing similar functions. The leaf is the principle organ to the tree; and, indeed, Linnæus divined, and Goethe demonstrated, the, beautiful fact, that the tree was developed from this curiously-formed organ.

"Keeping in view," says the poet-philosopher, "the observations that have been made, there will be no difficulty in discovering the leaf in the seed-vessel, notwithstanding the variable structure of that part and its peculiar combinations. Thus the pod is a leaf which is folded up and grown together at its edges, and the capsules consist of several leaves grown together, and the compound fruit is composed of several leaves united round a common centre, their sides being opened so as to form a communication between them, and their edges adhering together. This is obvious from capsules which, when ripe, split asunder, at which time each portion is a separate pod. It is also shown by different species of one genus, in which modifications exist of the principle on which their fruit is formed; for instance, the capsule of *nigilla orientalis* consists of pods assembled round a centre, and partially united; in *nigilla damascena* their union is complete."

Professor Lindley thus explains the same view: "Every flower, with its peduncle and bracteolæ, being the development of a flower-bud, and flower-buds being altogether analagous to leaf-buds, it follows as a corollary that every flower, with its peduncle and bracteolæ, is a metamorphosed branch.

"And, further, the flowers being abortive branches, whatever the laws are of the arrangement of branches with respect to each other, the same will be the laws of the flowers with respect to each other.

"In consequence of a flower and its peduncle being a branch in a particular state, the rudimentary or metamorphosed leaves which constitute bracteæ, floral envelopes, and sexes, are subject to exactly the same laws of arrangement as regularly-formed leaves."

The idea that the leaf is the principal organ of the plant, and that from it all the other organs are probably developed, is worthy the genius of the great German poet.

Every leaf, a mystery in itself, is an individual gifted with peculiar powers; they congregate in families, and each one ministers to the formation of the branch on which it hangs, and to the main trunk of the tree of which it is a member. The tree represents a world, every part exhibiting a mutual dependence.

"The one red leaf, the last of its clan,
That dances as often as dance it can;
Hanging so light and hanging so high,
On the topmost twig that looks up at the sky,"

is influenced by, and influences, the lowest root which pierces the humid soil. Like whispering voices, the trembling leaves sing rejoicingly in the breeze and summer sunshine, and they tremble alike with agony when the autumnal gale rends them from the parent stalk. The influences which pervade the whole, making up the sum of vital force, are disturbed by every movement throughout the system; a wound on a leaf is known to disturb the whole, and an injury inflicted on the trunk interferes with the processes which are the functions of every individual leaf.

The consideration of the physical circumstances necessary to germination and vegetable growth, brings us acquainted with many remarkable facts. At a temperature below the freezing point, seeds will not germinate; at the boiling point of the water, a chemical change is produced in the grain, and its power of germinating is destroyed. Heat, therefore, is necessary to the development of the embryo, but its power must only be exerted with certain

prescribed limits: these limits are only constant for the same class of seeds, they vary with almost every plant, This is apparent to every one, in the different periods required for germination by the seeds of dissimilar vegetables.

The seed is placed in the soil; shade is always—absolute darkness sometimes—necessary for the success of the germinating process. We have seen that the first operation of nature is peculiarly a chemical one, but this manifestation of affinity is due to an exertion of force, which is directly dependent upon solar power. If seeds are placed under all the necessary conditions of warmth and moisture, but exposed to unmixed light, they will not germinate; but if we obstruct the luminous rays, allowing the chemical power to act, which is to be done by the interposition of blue glass, the birth of the young plant proceeds without any interruption. But let us take a truly natural example. The seed is buried in the soil, when the genial showers of spring, and the increasing temperature of the earth, furnish the required conditions for this chemistry of life, and the plant eventually springs into sunshine. If, however, we place above the soil a yellow glass,—which we have shown possesses the property of separating light from actinism or chemical power,—and thus consequently insure the influence of only light and heat upon the soil, no seeds will germinate. If, on the contrary, a blue medium is employed, by which actinic power, freed from the interference of light, is rendered more active, germination takes place more readily than usual. Thus we obtain evidence that even through some depth of soil this peculiar solar power is efficient, and that under its excitement the first spring of life in the germ, is effected,

The cotyledons and the plumule being formed, the plant undergoes a remarkable change. The seed, like an animal, absorbed oxygen and exhaled carbonic acid; the first leaves secrete carbon from carbonic acid inspired, and send forth, as useless to the plant, an excess of oxygen gas.

This power of decomposing carbonic acid is a vital function which belongs to the leaves and barks. It has been stated, on the authority of Liebig, that during the night the plant acts only as a mere bundle of fibres,—that it allows of the circulation of carbonic acid and its evaporation, unchanged. In his eagernesss to support his chemical hypothesis of respiration, the able chemist neglected to inquire if this was absolutely correct. The healthy plant never ceases to decompose carbonic acid; but, during the night, when the excitement of light is removed, a much less quantity is decomposed, than when a stimulating sun, by the action of its rays, is compelling the exertion of every vital function.

During this process, we have another example of natural organic chemistry. The three inorganic elements of which the vegetable kingdom is composed, oxygen, hydrogen, and carbon, are absorbed as air or moisture by the leaves or through the roots, and the great phenomenon of vegetable life is the conversion of these to an organic condition. Sugar and gum are constantly produced, and from these, by combination with a little atmospheric nitrogen, a proteine compound is formed, which is an essential element in the progress of development.

Plants growing in the light are beautifully green, the intensity of coloring increasing with the brilliancy of the light. Those which are grown in the dark are etiolated, their tissues are weak and succulent, their leaves of a pale yellow. It is, therefore, evident that the formation of this chlorophylle—as the green coloring matter of leaves is called—results from action determined by the sun's rays.

Chlorophylle is a carbonaceous compound, formed in the leaves, serving, it would appear, many purposes in the process of assimilation. In the dark, the plant still requires carbon for its further development, and growing slowly, it removes it from the leaves, decomposing the chlorophylle, and supports its weak existence by preying on parts of its own structure, until at length, this being exhausted, it actually perishes of starvation.

This principle is effected in nature by the agency of light, *the luminous principle* as distinguished from radiant heat, actinism, or electricity. That power which is most active in the development of the germ, will not produce the excitement necessary for the decomposition of carbonic acid and the secretion of carbon; and under the influence of radiations which have permeated blue media, the plant grows in a succulent

state, the formation of wood being exceedingly small. Of course, each of the elementary forces plays an important part in the progress of growth: every power of the solar beam is necessary: the light to excite the plant to decompose carbonic acid, and heat and actinism to produce the formation of many of the peculiar juices natural to the various species. Plants always turn towards the light: the guiding power we know not, but the evidence of some impulsive or attracting force is strong: and the purpose for which they are constituted to obey it, is proved to be the dependence of vegetable existence upon luminous power.

Light is not, however, alone sufficient to perfect the plant: another agent is required to aid in the production of flowers and fruits, and this power is proved to be heat in some peculiar condition. Neither under the influence of the actinic or the luminous rays, as isolated by colored media, will the plant produce flowers; but having reached that point of development when the reproductive functions are, by another change in the chemical operations going on within the vegetable structure, to be called forth, it has been found that the heat rays, as completely separated as it is possible for them to be by red media, become in a remarkable manner effective. It has also been observed that plants bend from the red or calorific rays, instead of towards them, as they are found to do to every other ray of the spectrum. From this we may argue that the influence of these rays is to check the vegetative processes, and thus to insure the perfection of the reproductive organs.

Observations, which have been extended over many years, prove that with the seasons these solar powers are, relatively to each other, subject to an interesting change. In the spring the actinic power prevails, and during this period its agency is required for the development of the germ. As the summer comes on, the actinic rays diminish, and those of light increase. We see the necessity for this, since luminous power is required for the secretion of the carbon, with which the woody fibre is formed, and also for the elaboration of the proximate principles of the plant. Autumn, the season of fruit is characterized by an increase of the heat-rays, and a diminution of the others: this change being necessary, as science now teaches us, for the due production of flower and fruit.

The calorific rays of the solar beam, to which the autumnal phenomena of vegetation appear particularly to belong, are of a peculiar character; they exhibit a curious compound nature, and, to distinguish them from the purely calorific principle, they have been called the Parathermic rays. To these rays we may refer the ripening of fruit and grain, and the browning of the leaf before its fall. May not the rise of the sap in spring be traced to the excitement of either light or actinism, and its recession in the autumn, to that power from which the plant is found to bend, and which appears to be a modified form of heat?

There can be no doubt that the varieties of climate and the peculiarities, as it regards animal and vegetable productions, are dependent on the same causes. In every zone we find that vegetable organization is peculiarly fitted for the conditions by which it is surrounded. Under the equator, we have the spice-bearing trees, the nutmeg, the clove, the cinnamon, and the pepper-tree; there we have also the odoriferous sandal, the ebony, the banyan, and the teak; we have frankincense, and myrrh, and other incense bearing plants, the coffee-tree, the tea-plant, and tamarind.

A little further north we have the apricot, the citron, the peach and the walnut. In Spain, Sicily, and Italy, we have the orange and lemon-tree blooming rich with verdure, and the pomegranate and the myrtle growing wild upon the rocks. Beyond the Alps, the vegetation again changes; instead of the cypress, the chestnut, and the cork-tree, which prevail to the south of them, we have the oak, the beech, and the elm. Still further north, we have the Scotch and spruce fir and larch. On the northern shores of the Baltic, and in that line of latitute, the hazel alone appears; and beyond this the hoary alder, the sycamore, and the mountain ash. Within the Arctic circle we find the mezereum, the water-lilies, and the globe-flowers; and, when the intensity of the north-

ern cold becomes too severe even for these, the reindeer moss still lends an aspect of gladness to the otherwise sterile soil.

The cultivation of vegetables depends on the temperature of the clime. The vine flourishes where the mean annual temperature ranges between 50° and 73°, and it is only cultivated profitably within 30° S. and 50° N. of the equator. To the same limits is confined the cultivation of maize and of olives. Cotton is grown profitably up to latitude 46° in the Old World, but only up to 40° in the New. We have evidence derived from photographic phenomena, that the constitution of the solar rays varies with the latitude. The effects of the sun's rays, in France and England, in producing chemical change, are infinitely more decided than with far greater splendor of light, they are found to be in the lands under or near the equator.

Fungals are among the lowest forms of vegetation, but in these we have peculiarities which appear to link them with the animal kingdom. Marcet found that mushrooms absorbed oxygen, and disengaged carbonic acid. In all probablity, this is only a chemical phenomenon of a precisely similar character to that which we know takes place with decaying wood. In the conversion of wood into *humus*, oxygen is absorbed, and combining with the carbon, it is evolved as carbonic acid. Of course, we have the peculiar condition of vitality to modify the effect, and we have too, in this class of plants, the existence of a larger quantity of nitrogen than is found in any other vegetating substance.

These few sketches of remarkable phenomena connected with vegetation, are intended to show merely the operations of the physical powers of the universe, so far as we know them, upon these particular forms of organization. During the process of germination, electricity is, according to Pouillet, evolved; and again, in ripening fruits there appears to be some evidence of electrical currents. Vegetables are, however, in the growing state, such good conductors of electricty, that it is not, according to the laws of this force, possible that they should accumulate it, so that the luminous phenomena stated to have been observed, cannot be due to this agency. We know, however, that under every condition of change, whether induced by chemical or calorific action, electricity is set in motion; and we have reasons for believing that the excitation of light will also give rise to electrical circulation.

The question, whether plants possess sensation, whether they have any disposition of parts at all analogous to the nervous system of animals, has been often put forward, but as yet the answers have been unsatisfactory. The point is one well worthy all the attention of the vegetable physiologist; but, regarding plants as the link between the animal and the mineral kingdom,—looking upon phyto-chemistry, as exhibited by them, as the means employed to produce those more complex organizations which exist in animals,—we necessarily consider plants as mere natural machines for effecting organic arrangements, and, as such, that they cannot possess any nervous sensibility. Muscular contraction may be represented in many of their marvellous arrangements; and any disturbance produced by natural or artificial means, would consequently effect a change in the operation of those forces which combine to produce vegetable life. Indeed, the experiments of Carlo Matteucci, already referred to, prove that an incision across a leaf, the fracture of a branch, or the mere bruising of any part of the plant, interferes with the exercise of that power which, under the operation of luminous agency, decomposes carbonic acid, and effects the assimilation of the other elements.

To recapitulate. A plant is an organized creation; it is so in virtue of certain strange phyto-chemical operations, which are rendered active by the solar influences involved in the great phenomena of light, and by the excitation of caloric force and electrical circulation. It is a striking exemplification of the united action of certain empyreal powers, which give rise to the combination of inorganic principles under such forms that they become capable of obeying the mysterious impulses of life.

The poet has imaged the agency of external powers in various shapes of spiritualized beauty. From the goddess Flora, and her attendant nymphs, to the romantic enchantress who called up flowers by the light touch of her wand, we have, in all these creations, foreshadowings of the discovery of those powers which science has

shown are essential to vegetable life. A power from without influences the plant; but the animal is dependent upon a higher agency which is potent within him.

The poet's dream pleases the imaginative mind; and, associating in our ideas all that is graceful and loveable in the female form, with that diviner feeling which impresses the soul with the sense of some unseen spirituality, we perceive in the goddess, the enchantress, or the sylph, pure idealizations of the physical powers. The spirit floating over these forms of beauty, and adorning them with all the richness of color—painting the rose, and giving perfume to the violet—is, in the poet's mind one which ascends to nearly the highest point of etherealization, and which becomes indeed, to him, a spirit of the light; they ride upon the zephyrs, and they float, in all the luxury of an empyreal enjoyment, down to the earth upon a sunbeam. Such is the work of the imagination. What is the result of the search of plodding science after truth? The sunbeam has been torn into rays, and every ray tasked to tell of its ministry.

Nature has answered to some of the interrogations; and, passing over all the earth, echoed from plant to plant, we have one universal cry, proclaiming that every function of vegetable life is due to the spirits of the sun.

The mighty Adansonia of Senegal, hoary with the mosses of five thousand years,—the Pohon upas in their deadly valleys,—the climbing lianas of the Guiana forests,—the contorted serpent-cactus on the burning hills,—the oaks, which spread their branches in our tempered climes,—the glorious flowers of the intertropical regions, and those which gem our virent plains,—the reindeer lichen of northern lands, and the confervæ of the silent pool,—the greatest and humblest creations of the vegetable world,—all proclaim their direct dependence upon the mysterious forces which are bound together in the silver thread of light.

CHAPTER XV.

PHENOMENA OF ANIMAL LIFE.

Distinction between the Kingdoms of Nature—Progress of Animal Life—Sponges—Polypes—Infusoria—Animalculæ—Phosphorescent Animals—Annelidans—Myriapoda—Animal Metamorphoses—Fishes—Birds—Mammalia—Nervous System—Animal Electricity—Chemical Influences—Influence of Light on Animal Life—Animal Heat—Mechanical Action—Nervous Excitement—Man and the Animal Races, &c.

"A stone grows; plants grow and live; animals grow, live, and feel." Such were the distinctions made by Linnæus, between the conditions of the three kingdoms of nature. We cannot, however, but regard them as somewhat illogical. The stone—a solid mass of unorganized particles—enlarges, if placed in suitable conditions, by the accretion of other similar particles around it; but it does not, according to any of the senses in which we use the word, *grow*. Plants and animals grow; and they differ, probably, only in the phenomena of sensation. Yet, the trembling mimosa, and several other plants, appear to possess as much feeling as sponges and some of the lower classes of animals. By this definition, however, of the celebrated Sweedish naturalist, we have a popular and simple expression of a great fact.

As we have only to examine the question of the agency of the physical forces upon animal life, we must necessarily confine our attention to the more striking phenomena with which science has made us acquainted; and, having briefly traced the apparent order in which the advance of organization proceeded, we must direct our few concluding remarks to the physico-physiological influences, which we must confess to know but too imperfectly.

We learn that, during the states of progress which geology, looking into the arcana of time, has made us acquainted with, a great variety of animal forms were brought into existence. They lived their periods. The conditions of the surface, the sea, or the atmosphere were altered; and, no longer fitted for the enjoyments of the new life, these races passed away, and others occupied their places, which, in turn, went through all the stages of growth, maturity, and decay; until at length, the earth being fitted for the abode of the highest order of animals, they were called into existence; and man, the intellectual monarch of the world, was placed supreme amongst them all. Types of nearly all those forms of life which are found in the fossil state are now in existence; and if we examine the geographical distribution of animals—the

zones of elevation over the surface of the earth, and the zones of depth in the ocean, —we shall find, now existing, animal creations strikingly analogous to the primitive forms and conditions of the earth's inhabitants. From the depths of the ocean we may even now study—as that most indefatigable naturalist, Professor Edward Forbes, has done—the varying states of organization under the circumstances of imperfect light and varying temperature.

The gradual advance of animal life in the ascending strata has led to many speculations, ingenious and refined, on the progressive development of animals. That the changes of the inorganic world impressed new conditions on the organic structures of animals, to meet the necessities of their being, must be admitted. Comparative anatomy has demonstrated that such supposed differences really existed between the creatures of the secondary formations and those of the tertiary and the present periods. It has been imagined, but upon debatable foundations, that the atmosphere, during the secondary periods, was highly charged with carbonic acid; and, consequently, that though beneficial to the growth of plants, and peculiarly fitted for the conditions required by those which the fossil flora makes us acquainted with, it was not adapted to support any animals above the slow-breathing, cold-blooded fishes and reptiles. Under the action of the super-luxuriant vegetation of these periods, this carbonic acid is supposed to have been removed, and an addition of oxygen furnished; and thus, consequently, the earth gradually fitted for the abode of warm-blooded and quick-breathing creatures. We do, indeed, find a very marked line between the fossil remains of the lias formations which enclose the saurians, and the wealden, in which birds make their appearance more numerously than in any previous formation.

Founded upon these facts, speculations have been put forth on the gradual development of animals from the lowest up to the highest orders. Between the polype and man a continuous series has been imagined, every link of the chain being traced into connection with the one immediately succeeding it; and, through all the divisions, zoophytes, fishes, amphibia, reptiles, birds, and mammalia are seen, according to this hypothesis, to be derived by gradual advancement from the preceding orders. The first having given rise to amphibia, the amphibion gives birth to the reptile, the reptile advances to the bird, and from this class is developed the mammal. A slight investigation will convince us that this view has no foundation. Although a certain relationship may be found between some of the members of one class, and those of the other immediately joining it, yet this is equally discovered to exist towards classes more remote from each other; and in no one instance can we detect anything like the passage of an animal of one class into an animal of another; and until this is done, we cannot but regard the forms of animal life as distinct creations, each one fitted for its state of being, springing from the command of the great First Cause.

But it is time we quit these speculative questions, and proceed to the examination of the general conditions of animal life at the present time.

Lowest in the scale of animals, and scarcely distinguishable from a vegetable, we find the sponge, attached to and passing its life upon a rock, exhibiting, indeed, less signs of feeling than many of the vegetable tribes. The chemical differences between vegetables and sponges are, however, very decided; and we find in their tissues a large quantity of nitrogen, a true animal element, which exists, but in smaller quantities, in vegetables.

These creations standing between vegetable and animal life, possess the singular power of decomposing carbonic acid, as plants; and the water in which they live always contains an excess of free oxygen.

To be Continued.

IRON AND ITS COMPOUNDS.

As certain compounds of this metal are claiming the attention of very many photographers as to their application to the art, we have thought it advisable to include it in our series of articles on daguerreotype chemistry.

Iron is found native in a state of great purity in all parts of the world, the mines of the United States producing a large portion of that used in commerce. It is also very abundant in combination with sulphur and many other substances, such as oxygen, forming oxide; also in union with acids forming carbonates, sulphates, and phosphates. It may be obtained pure by passing dry hydrogen gas over pure oxide of iron heated to redness in a procelain tube.

Iron has a fibrous texture, freezes at a temperature of 158° Wedgewood's pyrometer, and has a specific gravity of 7.78. It is attracted by the magnet and is rendered magnetical by a variety of processes; a property possessed in common with cobalt and nickel only.

Iron when exposed to the action of a dry atmosphere, suffers but little change, but if moisture be present it soon oxidizes. When heated to redness in the open air, oxygen is absorbed rapidly, and scales of the black oxide of iron formed. At a high temperature metallic iron decomposes watery vapor, uniting with the oxygen and liberating the hydrogen gases.

Metallic iron dissolves in sulphuric and muriatic acids, with the evolution of hydrogen gas. Its oxides are also soluble in the acids.

The properties and uses of iron are too well known to require description, its application in almost every branch of art, science and manufacture, even in photography being almost infinite and well understood. It is the hardest of all malleable and ductile substances, and when combined with carbon or silver admits of being tempered to almost any degree of hardness and elasticity. It is less malleable, however, than many other metals, although remarkably ductile and possessing great tenacity. It can be drawn out into very thin wire, and may be made to burn beautifully in oxygen gas. It enters into combination with a great variety of substances many of which are used as medicine.

Chloride of Iron.—This compound is obtained by evaporating to dryness the protomuriate of iron. The oxygen of the oxide and the hydrogen of the muriatic acid combine to form water, whilst the chlorine and the metal unite to form the preparation named—which contains 28 equivalents of iron and 36 of chlorine. It may also be procured, although not in a perfectly pure state, by dissolving the sesquioxide of iron—common rust—in muriatic acid, evaporating to the consistence of syrup, and then crystalize. The resulting crystals are red.

Iodide of Iron—Is procured by adding to a soluble protosalt of iron a solution of the hydriodate of potassa. It is also formed when iron is heated in the vapor of iodine.

"A great deal has been written and said about the preparation of the iodide of iron, much of which is more amusing than instructive. There is in reality very little difficulty in the process. As soon as iron and iodine are mixed together, under water, much heat is evolved, and if too much water is not used the combination is soon completed, and the liquor merely requires to be evaporated to dryness out of contact with the air, at a heat not exceeding 112°. This is most cheaply and easily performed by employing a glass flask, with a thin broad bottom and a narrow mouth, by which means the involved steam will exclude air from the vessel. I have adopted the following formula with excellent results:—Iodine 18 oz; iron wire or filings 6 or 7 oz; water about one quart; mix in a glass or stone ware jug, agitate with an iron rod, (cautiously) when the temperature of the liquid will rise considerably, and the combination be completed in twenty or thirty minutes, without the application of external heat. When the liquor as-

sumes a pale green color decant it into a glass flask with a thin bottom, wash the remaining iron with a little water, filter, and add it to that already in the flask. Apply the heat of a sand bath, or a rose gas jet, (preferably the former) and evaporate to the consistency of a syrup as quickly as possible, then remove the flask into a water-bath containing 1-5 salt, and evaporate to dryness, observing not to stir the mass during the latter part of the process. The whole of the combined water may be known to be evaporated when the vapor ceases to be condensed on a piece of cold glass held over the mouth of the flask; a piece of moistened starch paper occasionally applied in the same way will indicate whether free iodine be evolved; should such be the case, the heat should be immediately lessened. When the evaporation is completed, the mouth of the flask should be stopped up by laying a piece of sheet india-rubber upon it, and upon that a flat weight; the flask must then be removed, and when cold, broken to pieces, the iodide weighed, and put into warm stoppered wide-mouth glass vials, which must be immediately closed, tied over with bladder, and the stoppers dipped into melted wax. Iodide of iron "evolves violet vapors by heat and sesquioxide remains. When freshly made it is totally soluble in water, and from this solution when kept in a badly stoppered vessel, sesquioxide of iron is very soon precipitated; but with iron wire immersed in it, it may be kept clear in a well stoppered vessel."—*Cooley.*

Sulphuret of Iron.—This is a native production called magnetic iron pyrites, but may be obtained for ordinary purposes by mixing four parts of sulphur and seven of iron filings together, and exposing the mixture to heat in a clean and dry Florence flask. The sulphur melts and combines with the iron, and a rich red glow takes place during the combustion. This sulphuret always contains free metallic iron. Equivalents 28 iron; 16 sulphur.

Phosphuret of Iron.—May be prepared by heating the phosphate of iron with charcoal. Its equivalents are twenty eight of iron to twelve of phosphorus.

Protoxide of Iron.—This is the compound recently applied to the photographic art by Mr. Fox Talbot of London, and by M. Lemoine of France. The process of the latter savant we gave in our third number of vol. 3. It is easily obtained by adding to any pure protosalt a solution of any pure alkali, potassa, or soda. The protoxide of iron is, when newly precipitated, of a white color rapidly passing to a green or bluish-green, then to a brown, and finally to a deep red-brown, when exposed to the combined action of light and the influence of the atmosphere. In consequence of its rapid absorption of oxygen gas it is rarely if ever obtained in a dry state. When iron is burnt in oxygen gas, or when a stream of watery vapor is poured over heated iron filings in a gun-barrel the protoxide is said to be the product. The protoxide has been obtained by passing dry hydrogen gas over the peroxide of iron. It is said to take fire suddenly, and burns vividly when exposed to air at common temperatures.—*Turner.* It readily dissolves in the acids forming protosalts of iron, the most important of which are the following:

1. *Acatate of Iron*—Contains 36 equivalents of protoxide of iron and 50 of acetic acid. It may be made by digesting iron in dilute acetic acid, or by mixing together the solutions of the protosulphate (recently prepared) and the acetate of lead or potash.

2. *Carbonate of Iron.*—This compound is obtained with great difficulty in consequence of the powerful affinity which the protoxide has for oxygen gas. When prepared in a careless manner, by adding to a solution of the phosphate of iron, a solution of the carbonate of soda, the product obtained has but very little of the true salt, containing in general from fifty to ninety per cent of the peroxide. It may be made as follows:—Dissolve four ounces of sulphate of iron and five ounces carbonate of soda each in one quart of water, mix the solutions, collect the precipitate, well wash it with cold water, drain on a cloth, squeeze out as much of the water as possible, add ℥ ij. of powdered sugar; mix and dry at a temperature not much above 120° F. The whole operation should be performed as quickly as possible. From the great difficulty of procuring it in its proper state, but very little is found in the shops of apothecaries or druggists.

3. *Protomuriate of Iron.*—This is a combination of 1 part, or 37 equivalents

of muriatic acid, with 1 part or 36 equivalents of protoxide of iron. It is prepared by pouring dilute muriatic acid upon clean iron filings or wire. The water suffers decomposition, protoxide of iron being formed, which combines with the acid, and hydrogen gas escapes. It has a green color.

4. *Protonitrate of Iron.*—Contains fifty-four equivalents of nitric acid to sixty three of oxide of iron. It is prepared by adding dilute nitric acid to iron turnings, in a flask or bottle. The iron becomes slowly oxidized and then combines with the acid. Upon concentrating the solution at a very gentle heat, the salt will crystalize in green crystals. It is insoluble in alcohol, and must be preserved free from contact with atmospheric air.

5. *Phosphate of Iron.*—Is made by precipitating a solution of sulphate of iron by another of phosphate of soda. When no more precipitate falls down decant the fluid, and wash and dry the residuum.

6. *Protosulphite of Iron.* This salt is much employed in commerce and in medicine, and is easily prepared by adding clean iron filings, perfectly free from rust, to dilute sulphuric acid—say one part of acid to six of water. A violent action takes place arising from a decomposition of the water and the disengagement of hydrogen gas—the oxygen of the water unites with the iron and forms an oxide, which combines with the acid, and produces a light-green colored liquid ; this by moderate evaporation and filtration will, upon cooling, yield crystals of a pale bluish green color soluble in two parts of cold, and less than their weight of boiling water. They may be preserved pure for a long time if kept in a well stoppered bottle, under alcohol.

Peroxide of Iron.—This compound differs from the protoxide of iron in having an addition of four more equivalents of oxygen. It is prepared by exposing for one or two hours to the action of a glowing fire, in an open furnace, the protosulphate of iron. By this means the water of crystalization is driven off, and the sulphuric acid decomposed, and a portion of oxygen uniting with the protoxide converts it into the peroxide of iron, which is of a bright reddish brown color.

Permuriate of Iron.—Is easily made by digesting peroxide of iron in a strong solution of muriatic acid, and evaporating to dryness. Its solution has a deep olive-green color. It is insoluble in alcohol.

Albuminate of Iron— Is prepared by precipitating a filtered solution of white of egg with another of persulphate of iron. Wash the deposit in water, and dissolve it in alcohol holding caustic potassa in solution.

The compound recently applied to the photographic art is composed of protoxide of iron and colodion, or gun-cotton dissolved in chloroform. We have already published—in our last—M. Lemoine's application of this compound, and we hope shortly to be able to present our readers with that of Mr. Fox Talbot.

"The protosalts of iron are distinguished by the action of the following reagents upon their solutions :

"*Potassa* produces a precipitate of a white color at first, which, however soon becomes grey and then green ; and lastly, when exposed to the action of the atmosphere, it assumes a brown appearance from its absorbing oxygen. *Ammonia* produces similar results.

"*Carbonate of Potassa* throws down a white carbonate of iron, soluble in a solution of ammonia ; the proto-carbonate of iron soon loses its carbonic acid by exposure, and absorbs oxygen gas ; consequently it becomes of a reddish brown color. *Carbonate of Ammonia* produces similar results.

"*Phosphate of Soda* produces in neutral solution of the protosalt of iron, a white precipitate ; which after long exposure to the air becomes of a green color.

"*Oxalic Acid*, *binoxalate of potassa*, and *the neutral oxalates* produce yellow colored solutions in protosalts.

"*Prusiate of Potassa* produce at first a white precipitate, which soon becomes blue by exposure to the air. *Red prusiate of potassa* causes a dark blue precipitate insoluble in acids.

"*Hydrosulphuret of ammonia* produces in neutral solutions of the protoxide of iron, a black precipitate, which by exposure to the air becomes of a reddish-brown.

"*Gallic Acid* produces a deep blue-black, in solution of the protosalts of iron."

From La Lumiere.

OF THE PROGRESS OF PHOTOGRAPHY, AND ITS FUTURE PROSPECTS.

Translated from the French by J. R. Snelling, M. D.

OUR predictions are verified with an unexpected apidity. The future prospects of heliography, of which we gave but an imperfect idea in our former articles, are being revealed from day to day, and only a few months have sufficed to bring about results to which we had assigned the term of several years. At the first appearance of this publication, we called the attention of photographers and of government o the old monuments of our national architecture, and we gave sketches of heliographic travels which were profitable to the art, calculated to excite emulation, yield new improvements, and confirm the power of execution of which the Niepce-Daguerrean invention is susceptible.

Our voice has undoubtedly been heard: government has entrusted skillful heliographers with embassies, which have resulted in productions surpassing everything of the kind previously witnessed.

We were impatiently looking for the period when photography, placed at the door of the public, would gain admittance and take rank among the industrial arts. The lucid publications of M. Piot and M. Blanquart Evrard did not keep us long waiting. The latter finally took the grand step towards the solution of a certain yet difficult problem—the foundation of a heliographic press. This conquest gained, comes to complete the honorable works of M. Blanquart Evrard. The unsatisfactory manufacture of papers proved the chief obstacle, and our indefatigable brother has so improved the preparation of the sheets, that he has succeeded in rendering papers useful which were of an inferior quality. Manufacturers so remiss in discerning their nearest interest, are even more so to foresee distant advantages. According to them, good photographic paper would not be profitable except to the art; they disdain to put the mind to the torture for such a poor prospect of remuneration.

M. Blanquart has reasoned in a very different manner from them. He has not limited the importance of good photograpic paper to the art alone, and feels satisfied, notwithstanding the opinion to the contrary that an improvement in this particular should interest the manufacturer and dealer as well as the photographer. We sincerely trust that he has reasoned correctly even in a business point of view, and that his *photographic* press may be crowned with the success which it deserves. By affording to our heliographers an easy, prompt, numerous, and economical printing of their good *proofs*. M. Blanquart, fully places them before the public; he entirely solves the problem, for the whole world, and places our colleagues in the position of designers and lithographers, furnishing them, like the latter, with a publisher.

In the letter with which he honored us, M. Blanquart has very reasonably advanced the opinion that his process is the most complete application of the principles laid down in his work, and it is not without reason that he calls for the co-operation of the heliographic Society.

To tell the truth, the time is admirably chosen. In the space of a few months he comes forward to constitute the basis of a picturesque and archeological museum of France. M. Bayard, as we have seen after two excursions brings us the monuments in Normandy: his negatives are very fine, and his points of view are happily selected. Saint Maclou, St. Ouen, l'hotel Bourghteroude, and the cathedral of Rouen, have been examined under different aspects, and we will have brilliant accounts to communicate to the numerous subscribers of the Journal. His colleage, M. Le Gray, explores, in company with M. Mestral, the countries of the Midi, Loire, and Mediterranean: he has not yet returned, but he has sent us valuable specimens of his productions. We have seen in his ateliers those which relate to the *chateau* de Blois, that fine and rigid page of the revival of art. The effects have been so well chosen, that several of his pictures have the won-

derful vigor, the powerful relief and semi-fantastic impressions of the engravings of the Pyrenees. Photography admits of a magic impression to which neither the design nor the painting has been able to attain, especially with regard to gothic edifices. It imparts the idea of grandeur, and of the boldness of proportions which the presence of these wonders inspire.

Yet, while the engraving, which faithfully represents the grandeur of Grecian and Roman structures, diminishes those of the middle age, photography, by inspiring everywhere the appearance of profusion, and by stamping the numerous details without drawing the outlines, presents to the delighted eyes as grand monuments as those of nature, and sometimes even more; because the ancient Chateau des Valois suggests to the mind the surprise which must naturally have been experienced in viewing this most magnificent of edifices.

That which strikes us most forcibly in these proofs, at the first glance, are the efforts manifested by our tourists to introduce the idea of color in their works; yet we certainly, do not speak here of the more or less brown color of the proofs. A design with a vermillion or liquorice root color may be cold and pale. The idea of color in an image, modeled with the aid of gradations of the same tint, is that kind of sharpness which leaves us to guess, under the same design, the incongruous shades, and aids us to divine the material of which the model is made. When a design reproduces age, shade, and the grain of stones,—when it represents the lively and harmonious opposites between the local tints of trees, grass, water, or earth, it denotes the skill of the colorist; and our heliographers having the proper taste and knowledge of science united, endeavor to introduce these essential qualities into their positive proofs, as well as lithographers and engravers. There, as everywhere, the soul is enlivened. The greatest improvement remains to be realized; the copying of skies, moving objects, and all bodies which are very luminous. To attain this desirable end, it is necessary to exercise our inventive powers; and as the daguerrean plate is more capable than the paper of being raised to an excessive sensibility by the employment of accelerative substances, it will no doubt be better adapted to the purpose. In this respect, we have wonders to describe. Lately, plates have been presented to the Academy of Sciences, in which were fixed the waves of the sea, the image of the sun, &c.

M. E. Bacot has already able rivals. Every one at Havre now admires the works of M. Hippolyte Macaire, who, in the space of a fraction of a second, and with the aid of an exposition so short that he has been able with a celerity truly wonderful to obtain the sky, the waves, fires with their flames, the effects of the sun, and mirrowing reflections upon the water of the ocean. M. Macaire has succeeded in fixing a carriage in motion, a man upon the march, a horse upon the trot, steam-ships with their smoking chimnies, and the crests of foam which were dashed out from the wheel paddles.

We have received in relation to this, the most interesting communications of a distinguished artist and very accomplished designer and sculptor, M. Aime Millet, to whom we are indebted for a copy with the stamp of the *Joconde*, almost as admirable as the original picture, and purchased by the administration of fine arts.

M. Millet arrived at Havre, admired the surprising collection of M. Macaire, and purchased two subjects himself which he has shown us. One represents the going out and the other the coming in of a brig, at the end of the pier at Havre. In these designs are combined the sky with its clouds, the ship with all sails unfurled to the wind, with its flags floating in the breeze, and the foaming waves. Nothing equals the clearness of these different objects, unless it be their extreme simplicity. We might imagine it some old design of Ruysdæl or Backhuisen. The floating banners are as plainly shown as if they had been placed before the object-glass at a moment of immobility; and the yawls, the shallops with oars, dancing upon the summit of the waves and produced upon the daguerrean plate to the diminutiveness of lenses, permits us to count the oarsmen and discern them with the magnifying glass. In regard to our unaided power of vision, we not only see the billow rise to a peak ready to unfurl itself, but upon the smooth and mobile parts of the volute liquid, we distinguish the reflection of the passing vessel much better than it would be repre-

sented in nature, in which this mirage is too fugitive. Thus the reproduction takes place in spite of three different and combined movements; the balancing of the wave, the ship and the object being reflected upon a very movable plane.

Agitated by a fresh breeze, the sea is lashed into billows which in their fall roll into curls [of foam quite similar to small shavings of white wood. This silvery foam is boldy drawn, with its jagged splashings, and frail lace work of the sea. If a sea-gull passes during the exposition, skimming the wave, it is taken upon the plate. White vapor and dark smoke can be also seized in their undulating flight: this is magic; never has there been produced any thing more miraculous since the day that Joshua, the son of Nun, commanded the sun to stand still.

These pictures might furnish marine painters with profitable lessons, by showing them that they have singularly exaggerated the effects and reliefs of troubled waters, &c.

To satisfy the impatience of those who are not able to purchase the plates of M. Macaire at their present high price, could he not draw after these same plates, some counter-proofs upon paper, in order to give us a more satisfactory idea of those works, which we have been induced to mention from seeing two specimens only; very curious, it is true, and which contain all which we have represented to others?

Finally, as our object is particularly to render heliography popular, encourage those who cultivate it, and put them in the way of success, we ought to invite competition in the prosecution of works similar to those of M. Macaire. His processes are not very secret, and the substances are ascertained; the application alone is ingenious, as well as novel, and the principal requisite for matching it will depend upon manual dexterity. It is said that the finest heliographic plates of Havre are raised with avidity, by amateurs, to the price of one hundred francs. We will confine ourselves to the description of a sale so lucrative; it would afford just compensations to those who for years have sought such beautiful improvements with the object of delivering at a price, from day to day more moderate, productions which are more and more fine. These considerations remind us of M. Eugene Piot who, after having devoted the summer in his efforts to still farther improve his fine *Album* of Italian monuments, has succeeded in obtaining proofs more than 18 inches high, with a very small traveling apparatus. Sanguine of the success of his processes, this conscientious and zealous heliographer, is preparing to reproduce the palace and canals at Venice.

We see, from this cursory narrative, that photography acquires every day a new importance. Already, under the impulsion of government it bids fair to substitute its designs for the costly engravings and less accurate picturesque monographs. The era of publications has commenced. M. Blanquart Evrard establishes a press, and M. Macaire gives us that which no human art had been able to fix with absolute precision: Nature taken upon the flight and motion seized in its changing physiognomy. Hitherto the struggle was possible; but upon the earth the art is distanced, because we behold it limited to taking from heliography what it is impossible to forsee except by a suitable interpretation.

But as we have acquired in our age a habit for novelties, this discovery, already pushed so far in its applications, is considered by the public as in embryo *which promises* greater things. In its anxiety to rush towards the mysteries of the future, it turns from the past and is ungrateful towards the geniuses who by lately bringing to light these hidden wonders, have bequeathed to our country the glory of priority. This public torpor of heart and mind leaves in neglect the tombs of Niepce and Daguerre. The grass scarcely covers their graves before their deeds are erased from the memory. And if America does not take, from this circumstance, a higher position in regard to this subject, the monument to Daguerre and Niepce will never rise to shed glory upon our country.

Francis Wey.

A TREATISE ON PAPER PHOTOGRAPHS.*

BY M. BLANQUART EVRARD

Translated from the French, by J. R. Snelling, M. D.

MEANS FOR MULITIPLYING NEGATIVE PROOFS.

NEGATIVE proofs may be reproduced in two ways: by superposition and by means of the camera-obscura.

We will speak first of the reproduction by superposition. We submit an albumenized glass to the aceto-nitrate, conforming to the instructions which we have given in chapter IV. After having washed the glass with distilled water, we slowly dry it.

When the albumen is perfectly dry, which requires at least half a day, we place it in contact with the impressionable surface of the negative which is to be reproduced. We press the proof upon the glass, by means of two other glasses, exactly as in the drawing of positive proofs.

It is indispensable to preserve the back of the albumenized glass from the action of light: After an exposition of from two to six seconds if we operate in the sun, and from fifteen to thirty seconds if we operate in the shade, we submit the glass to gallic acid; we take measures to insure the slow and regular development of the image. It is necessary, therefore, to proceed cautiously with the exposition.

We obtain, for this operation, a positive proof on glass which then serves to multiply, as many as we wish, the first negative proof.

We might think perhaps that an ordinary positive proof could answer the same purpose, but such is not the case as any operator who avoids this particular method, will be convinced; for however powerful the positive proofs may be, they are never enough so to reproduce by reversion good negatives.

When we possess a good negative proof, we need not produce others, unless we wish to modify the general character and therefore produce, with facility and by the same process, positive proofs entirely different. We may, indeed, conform to the directions given, of reviving or enfeebling the lights, increasing or diminishing the passage of the shades to full lights, and disposing the secondary effects in reference to the principal subject.

The reproduction of negative proofs is therefore impossible by optical means.

When reproducing a negative proof by means of the camera, we make use of a fine positive proof as with an engraving, and the operation comprises entirely what we have said of these kinds of reproductions.

When we reproduce a negative by this method, we can give to the new proof more delicacy than that which has served for the model, and for this purpose it is sufficient to reduce the dimensions in the camera.

We may make the operation inverse, that is to say, with a small proof, obtain a larger one. For this, it is sufficient to bring the object-glass near the first proof, and remove the draw which bears the holder, by means of a second box which is adapted to this draw.

Although the image which is produced in these new conditions, may be regular and without deformity, it is necessary to determine by trial the point where it will be best to place the exterior proof and to fix the drawer.

The advantage which there is in thus multipyling the negative proofs which we possess, consists in replacing a negative on paper by a negative on glass, the use of which is at the same time more convenient and admits of the best results.

All positive proofs without distinction are not suitable for furnishing good negatives, it is necessary to avoid, with great care, using for this purpose a positive in which the paper is rough; and to weaken the impression which the grain

would produce upon the glass. A positive proof must be chosen much colored, and weakened by soaking it in a hyposulphite bath. The action of this salt destroys all the color of the lights; it is true that it weakens at the same time the vigor of the shades; but by reason of the somewhat exaggerated strength which is imparted to them, this weakening effect does not interfere in the least with the harmony of the picture.

Finally, by skillful retouching, we may improve a proof and afterwards efface the traces which the brush or pencil may leave in their passage, by reproducing this proof in the camera, as if it were an ordinary engraving. In this way, we obtain a new positive in which art and photography have combined to give to the picture greater charm and variety.

METHOD FOR STRENGTHENING POSITIVE PROOFS.

Positive proofs can be strengthened by gallic acid, as well as negatives.

However, there are two conditions which must be observed, to arrive at satisfactory results: The first is, that the paper should not contain the slightest trace of photogenic salt; and the second is, that the paper should be submitted to the action of crystallizable acetic acid, before being submitted anew to gallic acid. Acetic acid limits the action of this last acid to the colored parts of the proof only.

When the positive has been submitted to acetic acid, it ought to be transparent, and have the same appearance as a sheet of oil paper.

If the proofs are rough, it is impossible to strengthen them, because the paper contains an excess of photogenic salts which would grow dark under the influence of gallic acid to such a degree as to render the proof entirely black.

But if the proof is perfectly transparent, the gallic acid with the addition of two or three drops of aceto-nitrate, produces its full effect and strengthens the image, without compromising the proof.

When the proof arrives at the proper degree of coloration, we arrest the action of gallic acid by plunging the proof in a bath of hyposulphite. This bath should be concentrated.

It is also an advantage to employ hyposulphite which has never been used. Its action is more energetic, and the white parts of the design acquire more brilliancy.

If we desired to make use of an old solution of hyposulphite, we might still do so, but it would then be necessary to add acetic acid, and wash the proof freely with water, when we withdraw it from the gallic acid.

Under the influence of gallic acid, the proof is colored red, but this coloration immediately disappears under the influence of the acidulated hyposulphite, and the proofs acquire a dark color of the appearance of an engraving with an aqua tint, which gives them much brilliancy and energy. It is necessary for this shade to be produced in eight or ten minutes. When the proof finally acquires the appearance which we desire, we remove it from the hyposulphite, wash it freely with water, and let it soak for half-a-day in a basin in which we renew the water from time to time.

After this treatment, the proof, which in a great measure was gray and dim, becomes brilliant and lively colored, but although this effect is produced, it is necessary that the proof should be free from photogenic salts when it is fixed after removing it from the camera-obscura.

Thus a proof too little developed, in consequence of a too short exposition, may be strengthened, by following the process which we describe; by the same process we may impart to a proof too much discolored by the hyposulphite, all its primitive brilliancy. Finally, this treatment can change the coloring of a proof which may be defective in this respect, and give it all the attractiveness of a perfectly successful proof.

If instead of obtaining proofs of a dark shade, we wish to give them a sepia color, it would be necessary to replace the bath of acidulated hyposulphite by a bath of bromide of potassium. But we are unable to affirm whether in this last instance, the proof would keep as well, or as long; the experiments, which we have made being too limited and of too recent a date, to justify a decision in this respect.

METHOD FOR DISCOLORING POSITIVE PROOFS.

When a positive proof is too much co-

lored, or its coloration too uniform, either from abuse of exposition, or from having the general tone too much strengthened by the acidulated hyposulphite bath, we may improve in a remarkable manner the general tone of the proof, by passing it in a very dilute bath of bromide of iodine, as we have directed for negatives.

The bromide of iodine hardly colors the water, we soak the proof in the bath taking care to dispel the air bubbles which might adhere to its surface and render the contact imperfect between the paper and liquid. The proof must be shaken gently, and it is necessary also to work in preference by daylight, in order to better watch the operation. When the back of the proof acquires a slightly lilac tint, it is evidence that the paper does not contain an excess of hyposulphite, and the success of the operation is certain.

If the proof which undergoes this process of amelioration is too vigorous and wants proper gradation in the passage from the lights to the shades, the action of the bromide of iodine must be prolonged, until the white parts of the design become clear blue. It is then time to arrest the action of the bromide, which is done by means of the hyposulphite, as in all actions of this kind.

When the hyposulphite has produced its due effect, we wash the proof freely with water, and dry it by the ordinary processes.

A proof which needs softness and delicacy of outline, completely changes its appearance, under the influence of this treatment, and the demi-tints which were too vigorous, are now represented in the most satisfactory manner, and the requisite harmony is supplied to the picture.

It is difficult for us to decide more definitely, the degree of concentration in which it is necessary to employ the bromide of iodine and the time in which its action ought to last: the effect which it occasions depends upon the coloration of the proof used, and the effect to be produced for improving the design, varies with each of them.

When the bromide of iodine acts too quick, the proof wants harmony and outline, and the colored parts are attacked with too much vigor; when the bromide acts too long, the result which we obtain is also defective, and the lights become too extended.

As in all the operations of this kind, it will be found well to proceed with care; there will be every advantage in keeping within the full action which the bromide of iodine is capable of producing.

In this manner we control the liability of its going back, and completing by a second bath of bromide of iodine the deficient action of the first. This recommendation is the more important, as it is impossible to strengthen a proof by gallic acid which has been too much weakened by the bromide of iodine. The coloration of the proof is much increased, but it is concealed, and the result is defective, for it then wants clearness, outline, and demi-tints.

BLEACHING OLD PROOFS.

When baths of hyposulphite which are very old are made use of, and consequently much charged with salts of silver, it sometimes happens that the proofs are colored yellow, and acquire the smoked appearance of an old design.

In certain cases, this coloration, far from injuring the design, gives it on the contrary much beauty, but these results are only exceptions and generally speaking, it is necessary to avoid this coloration; but finally, if this coloration is produced, it would be very easy to make it disappear, and give the design all the freshness of an irreproachable proof. For this purpose, it suffices to soak the proof in a bath of bromide of iodine. The bath ought to to be very weak, in order to moderate its action which we can easily oversee, by working in the light of day.

We arrest the action of bromide, by means of a new bath of acidulated hyposulphite. If it should happen that the proof had not completely lost its yellow tint, after one treatment, nothing would prevent us from having recourse to a second, and if necessary, even a third.

The discoloration of positive proofs is effected with the greatest facility, when these are obtained by the ordinary processes, but when the paper is albumenized, it is almost impossible to obtain a satisfactory result, because the bromide of iodine attacks the albumen with extreme energy, and disorganizes it to such a degree as to destroy the design entirely.

PROOFS WHICH ARE INTENDED TO SERVE AS OUTLINES FOR DESIGNS OR WATER-COLORED PAINTINGS.

Independently of the proofs which are preserved in their natural state, and which have occupied our attention up to the present time, photography can furnish others, which may serve as outlines to the artist for making designs or water-colored paintings.

This kind of proof should be scarcely colored, in order that it should not communicate to the painting, which afterwards covers them, a leaden aspect. The lights, shades, and demi-tints, should be well defined, notwithstanding the slight coloration of the more powerful shades.

In this way, the artist arranges the local tints, and produces in its stead a sepia or water color, the photographic impression being sufficiently pale to comply with all the possible colorations.

To produce this kind of proofs, we cannot employ a common proof, as it would be weakened by the process of which we speak: the tone of the paper and the image would not have the freshness which is necessary for a design or a water colored painting.

We cannot make use of a proof which is very weak, because the design would need the clearness and precision which are the wished for results of the artist.

When we wish to obtain proofs for a design, it is necessary in every instance to have recourse to a special positive paper. In making the preparation described in Chapter VIII., it is sufficient to dilute the bath of silver with four or five times its volume of water, in order to obtain a suitable paper. Whatever may be the time of exposition, the image only acquires a silver tint, which may serve as the artist s first preparations.

APPENDIX.

Since delivering to the press the first sheets of this Treatise, photography has been enriched with a certain number of new discoveries, which have a true importance, and deserve to be described to our readers.

NEGATIVE PROOFS ON PAPER.

To avoid the spots which are formed upon certain papers, in spite of all the precautions taken in their preparations, M. Guillot Saguez, has proposed to omit the first bath of nitrate of silver. M. C. Laborde condemns the process of M. Guillot Saguez, as not furnishing sufficiently powerful tones.

To give the paper its proper quality, without exposing it to the danger of spots, M. C. Laborde proposes, in his turn, the following process:

Dissolve one gramme of cyanide of potassium in thirty grammes of distilled water; add to this solution iodide of silver recently precipitated, until the liquid is saturated with it. Then filter it and add four grammes of iodide of potassium dissolved in sixty grammes of distilled water. Pour the liquid in a basin, and use it in the same manner as the ordinary solution of nitrate of silver. Upon withdrawing it from the bath, the paper is dried between sheets of blotting paper, and may be used immediately.

M. Laborde has proposed, also, to add parts of acetate of lime, to the gallic acid bath, to increase the reductive power of this agent, and thus render the proofs more vigorous; or the nitrate of lead, to obtain better back-grounds. M. Regnault has proposed to replace gallic acid by the pyrogallic acid. In the proportion of a gramme to a litre of water, its action is at the same time more prompt and more energetic for developing the image after exposition.

M. Peuvion Colle* has shown us negatives on paper, obtained almost instantaneously by means of cyanide of silver, but in these proofs, the light parts did not attain a suitable intensity before the demi-tints and shades were shrouded under a uniform coloration. We have not tested any of these methods, and in publishing them we simply fill the character of historian of the science, leaving to each author the responsibility of his own assertions.

NEGATIVE PROOFS ON GLASS.

M. Niepce de St. Victor to whom photography owes such happy improvements, proposes to add 2 or 3 grammes of Narbonne honey to each white of egg. Ac-

* M. Peuvion Colle was the first to employ serum of milk to prevent proofs from spotting. To this abie operator do we owe our knowledge of this useful property.

cording to M. Niepce, this addition renders the glasses more impressionable.

Beat together the whites of eggs and the honey, and then add from 30 to 40 centigrammes of iodide of potassium for each white of egg. When the albumen (white of egg) returns to the liquid state, spread it upon the glasses, as customary.

On his side, M. Humbert de Molard, has extolled, for the same purpose, molasses, syrup of sugar, sugar of milk, mucilage of quinces and marsh mallow, &c. M. Humbert de Molard proposes, moreover, to employ iodide of silver in a state of double iodide of silver and potassium. He operates in the following manner:

He covers the glasses with an ordinary coating of albumen. When the albumen is dry, he puts them in a bath of pure nitric acid, at a temperature of 7 or 8 degrees. Upon taking them from this bath, he passes them into diluted aqua ammonia, in order to neutralize the acid, then finally he washes them freely with water.

The acid bath coagulates the albumen; the alkaline bath neutralizes the excess of acid and the washings with water cleanse the albumen of the nitrate of ammonia which is formed.

When the glasses are well washed, place them on a support and cover them, by means of a brush, with a solution of liquid iodide of silver. This solution is obtained by dissolving the oxide of silver to saturation in the bath of iodide of potassium.

At the expiration of a minute plunge the glass in a basin filled with water. The glass acquires a golden yellow shade, and a precipitate forms which is removed by means of washings. In order to expose it to the camera, there is nothing more to do except to submit it to the aceto nitrate.

According to M. M. Humbert de Molard and Niepce, glass thus prepared produces an image complete in 30, 40 or 50 seconds in the shade, with an object-glass the focal length of which is 33 centimetres.

We have tried, and others also have tried this process after us. Unfortunately, the results have not responded to our expectation, and in spite of all the precautions which we have taken we have always failed in our attempts.

When the glasses have received the coating of iodide of silver, and been washed freely with water to remove the precipitate, the albumen is detached or altered to such an extent as to render a good result difficult.

And now that we have reported the works of others, we may be allowed to speak of our own personal works.

TRANSFORMATION OF THE CAMERA-OBSCURA INTO THE WHITENED CAMERA.

Among the most important improvements which we have been able to make in old photographic processes, we will describe in the first rank, the transformation of the camera-obscura into the whitened camera.

By pasting white paper upon the interior walls of the camera-obscura, or what is preferable, by covering them with a coat of white paint, we increase the impressibility of papers and glasses in the proportion of nine to fifteen, that is to say, nearly one-half.

Independently of acceleration in the operation, the image presents more harmony in its *ensemble*. The passage of the shades to the lights is less dry and better graduated.

This result is much more valuable from the fact, that the proofs are generally injured by exaggerated contrasts, especially when we operate upon glass.

A still more valuable result is, that the green, yellow, and red colors, which produce so little action upon the sensitive coating, when we operate with the camera-obscura, are much better revealed, when we have recourse to the white camera.

Finally, the use of the whitened camera, admits of the formation of the image, with a light, which is never permitted with the black camera-obscura, whatever may be the duration of exposition.

It results from the foregoing, that the whitened camera presents great advantages over the camera-obscura.

It is true, the accuracy of our assertions are disputed. Unfortunately in questions of practice, an experiment well made is more conclusive than all the reasoning of the world, and to those who manifest an opposition to the whitened camera, we will simply say: renew the expirement. If you fail in your new attempts, try again, and the time will arrive when you will be persuaded that the want of success was owing to the operator, and not the apparatus.

NEW PROCESS, MORE EASY AND CERTAIN FOR THE PREPARATION OF ALBUMENIZED GLASSES.

Beat eggs into a foam as usual, but without the addition of foreign substances, and let them liquify; then filter the liquid through tissue paper.

Cleanse the glasses to be albumenized first with water, then with alcohol. When the glasses are in the proper state, place them one after another upon a smooth metallic support, like that which answers for plates submitted to chloride of gold, in photography on metal. Heat the glass by means of a small spirit lamp. Apply the flame of the lamp over the whole surface of the glass, in order that it may be heated very equally. When its temperature rises to nearly 40 or 50 degrees, pour upon the surface one or two spoonsful of strained albumen; heat it a little more, and then incline the glass so as to let the excess of albumen drain off. While the albumen is draining, heat a thick glass which is fixed in a wooden frame, in such a manner as to form the bottom of a box or basin. The interior surface of glass is covered with a cloth, the edges of which terminate upon and are attached to the four sides of the frame.

When the glass is hot, pour upon the cloth a little crystallizable acetic acid, and reversing the frame, apply it upon a second wooden frame at the bottom of which is placed the albumenized glass.

The whole apparatus is then composed of a box in two parts, one of which has a wooden bottom, and the other a glass bottom; the part which has the glass bottom, forms the upper, and the part which has the wooden bottom, the lower side of the box.

Under the influence of the heated glass, the acetic acid is changed into vapor; the vapor acts upon the albumen of the glass, and coagulates in two or three minutes. The glass then acquires a rough appearance which somewhat resembles the biscuit of porcelain.

While a glass is exposed to the action of acetic acid, and while its albumen is coagulated, cover a second glass with albumen, so that when the first is coagulated, the second is ready to take its place in the box.

If we wish to use the glasses immediately, it is necessary to complete their dessication by means of the spirit-lamp, and if necessary we moderate the heat by increasing the distance of the flame. When there is no hurry, it answers to place the glasses near each other upon a perfectly horizontal surface. Their dessication is effected spontaneously in a sufficiently short time.

It is important, in the course of the operations, to cover the support well upon which we place the glass.

To render the glasses thus obtained photogenic, proceed in the following manner:

Dissolve five parts of nitrate of silver in one hundred parts of distilled water.

Plunge a glass in this solution; then withdraw it, and knock it upon the table by one of its corners, in order to shake off the small drops of liquid which adhere to its surface; after which, let it dry, by keeping it always in an upright position. When the glass is dry, plunge it into another bath, composed of five parts of iodide of potassium, and one hundred parts of water, and then proceed in the same manner as upon the removal from the first bath.

Glasses thus prepared keep a very long time—for whole months—without losing any of their good qualities.

When we wish to use a glass thus prepared, we submit it to the aceto-nitrate of silver, by conforming to the directions which we have given in this respect.

With these new glasses, the accelerative agents as the fluoride, or better still, the cyanide of potassium, do not produce to the same extent, the accidents which we have described, and which render their use so difficult.

Moreover, glasses prepared as we describe, are very sensitive to the action of light, and in many cases may do away with the necessity of resorting to accelerative agents. When we bring out the image with gallic acid, it is necessary to be careful, for it is much more liable to pass beyond the limit which insures to the proof all the desirable qualities.

When we employ the albumen, with the addition of honey and iodide of of potassium, according to the method of M. Niepce de St. Victor, we find it very advantageous to congeal it upon the plates

of glass, by exposing these to the vapors of acetic acid.

This modification by M. Niepce, alone is sufficient to change entirely the character and merit of proofs.

Proofs upon albumen most generally want harmony and outline. The passage of the lights to the shades is made too abruptly. By using acetic acid to congeal the albumen, we avoid in a great measure this defect; the proofs do not present the strong contrasts which depreciates them.

The use of acetic acid has still another advantage. It renders the plates already prepared less deliquescent, and preserves them better.

When we employ albumen with the addition of honey, and congeal it with the vapor of acetic acid, it is necessary to bestow the most minute attention to washing the proofs, when we withdraw them from the gallic acid and hyposulphite bath. Very quick movements would be liable to detach the albumen; when the albumen is moist it scarcely adheres to the glass, although after it becomes dry its adherence is very firm. When the albumen is dry and when the proof is finished, it at once has the aspect of biscuit, and we must convince ourselves, by testing it, whether it admits of good positive proofs.

When the action of acetic acid has been too energetic, or when the coating of albumen is a little too thick, it then happens that the positive proof is concealed. To remedy this difficulty, it suffices to varnish the proof, by which means it acquires all the transparence necessary for excellent productions.

ALBUMENIZED NEGATIVE PAPERS.

Albumenized negative papers, according to the method which we have described in Chapt. III. and IV., are more convenient and insure better results, if we congeal the albumen with the vapors of acetic acid. We use for effecting this congelation, a deep box closely shut. In the bottom of this box, we lay one or more capsules filled with crystallizable acetic acid. The paper is hung inside of the box by means of strings arranged for this purpose; the box being perfectly closed, at the end of twenty-four hours the vapors of acetic acid will have produced their full effect.

POSITIVE ALBUMENIZED PAPERS.

The method described in the preceding paragraph may be followed for congealing albumen upon positive papers prepared according to the description given in Chapt. VIII.

POSITIVE PROOFS OBTAINED IN A FEW SECONDS.

Until the present time photography has been banished from the domain of trade. Its products are too dear, and the processes for obtaining them too long and complicated, to admit of the establishment of proof factories, as presses are established for copper plate printing, or the work-shops of lithography.

In the present circumstances, we cannot obtain more than three or four positive proofs per day, with the same negative proof, and moreover each positive proof requires a treatment of several days. Each proof also costs from 5 to 10 francs.

By the process which we are about to describe, each negative can readily furnish two or three hundred positive proofs per day, which may be finished the same day, and the price of which will not exceed more than from 5 to 15 centimes. So, in a vat where 30 or 40 negatives can be prepared daily, we might easily produce four or five thousand positive proofs per day, at a price so moderate that the book-seller can have recourse to it for illustrating his publications.

The new process consists as follows:

Submit the paper to the aceto-nitrate of silver, by following the method which we have pointed out in Chapter V., page 355, Vol. 2. The paper ought to be prepared by the process which we have described in Chapter IV., page 350, Vol. 2, except that we add a gramme of cyanide of potassium for every litre of serum.

You should choose for the sake of economy a fine paper; it absorbs less of the salt of silver.

The aceto-nitrate used ought to be perfectly white, and composed in the following manner:

Nitrate of silver,	1 part
Distilled water,	6 "
Crystallizable acetic acid,	3 "

When the paper becomes transparent dry it between several sheets of blotting paper, renewed sufficiently often. If you

use the paper immediately, pile the sheets upon each other, in such a manner as to keep them in a state of constant humidity. By taking this precaution you can wait several hours, with impunity, before using the paper.

To obtain a positive proof, we make use of this paper as with the ordinary positive paper. We place the nitrated side in contact with the image of the negative proof; we shut the negative and the paper in a holder, so as to make the effect of the contact as perfect as possible, and we then expose the holder to light; in the sun, five or six seconds are sufficient; in the shade thirty or forty seconds are necessary. In calculating the day's work, the first proofs must be considered the tests for determining the time of exposition.

Upon withdrawing it from the holder, the proof is plunged into a bath saturated with gallic acid, in which was previously dissolved one or two per cent of crystallizable acetic acid. The proof is then developed in all its parts. It first acquires a red tint, which finally passes to a deep brown.

When the proof has acquired a sufficiently strong tone, withdraw it from the gallic acid bath, and pass it into a bath of hyposulphite strongly acidulated. Under the influence of the hyposulphite the parts of the image which had preserved a reddish tone, lose it completely; the general tone becomes dark, and the paper which had acquired a yellow citron tint regains all its whiteness. In general, eight or ten minutes are sufficient for the hyposulphite to produce its full action.

When withdrawn from the bath, the proof is washed freely with water, and soaked in a vessel filled with water, which is replenished from time to time.

We might also, by this method obtain positive proofs on albumenized paper.

Negative proofs on albumen, and particularly those on glass, are more conveniently used, and give more perfect positives.

The possibility of producing with facility and in considerable number, good positive proofs, is owing to the addition of acetic acid to the baths of gallic acid and hyposulphite of soda. Without the aid of this acid we should obtain proofs without uniformity, brown and dull, which renders them unacceptable as productions of art, and consequently as useless productions.

SCENES IN AN ARTISTS STUDIO.—No. 1.

BY FAIRY FAY.

"IS not your occupation extremely unhealthy?" inquired a young gentleman of his friend a daguerreotypist. "You must inhale constantly so many poisonous fumes from acids and alkalies, and divers other pernicious substances necessary to the art, and besides, it must be very monotonous."

"In reply to the first of your queries," said the artist, "the substances which we use, such as bromine, mercury, hydrofluoric acid, &c., are rather pernicious, but we are extremely careful to avoid inhaling them more than is necessary—and indeed, our art is so completely fascinating that we forget all danger to ourselves in pursuing it; besides it affords us both pleasure and amusement."

"Pleasure!"

"Yes."

"In what way?"

"Why, in gazing upon so many beautiful faces, as are daily, nay hourly, seated before us. Now look at this picture. Is it not the ideal of the poet, or what im-

agination calls up as the fac simile of an angel?"

The visitor gazed long upon the lovely vision presented for his criticism. "Beautiful!" he exclaimed; "alas! too beautiful to be *real.* I fear each moment that it will dissolve in air, or exhale in the sunbeams which produced it. Can this be really the portrait of a living being, or has your celestial agent, the sun, imaged upon the plate a divinity above this human sphere?"

"I am as much flattered as Apelles must have been when called upon to draw aside his curtain," exclaimed the young artist.

"Pray explain; I am not much versed in Greek history."

"Well, every one knows, who is a worshiper of the art of painting, that the Greeks were the first to encourage and support it. Wreaths of laurel awaited the successful competitor during life, and upon the monumental slab his name was engraved in glowing characters after death. At one time there arose two great painters gifted equally with the same enthusiasm, the same energy, and without being enemies, equal rivals for success and eternal fame. One of these was named Praxitiles, the other Apelles. It was difficult to say which should bear away the palm. As we in this country choose a president by vote, or the unanimous voice of the people, so it was decided that the laurel of victory should be bestowed upon him who in the presence of a vast number of citizens should produce a picture so exquisitely true to nature as to call forth universal commendation. A day was appointed—the pictures produced, and the multitude assembled to decide upon their merits. One represented a basket of fruit. It was so true to nature, that the critics loudly applauded, and, to crown the success of the artist, while all were gazing at the picture, some birds flew in at the window and lit upon the tempting fruit.

"There!" exclaimed the triumphant painter. "Nature herself has decided in my favor. What could be a better evidence of the truth of my picture than the fact that I have deceived even the birds? Come"—turning to Apelles, who was the rival artist, "Come, now draw aside your curtain, and let us see your picture."

"Ah!" said Apelles, calmly, "*You* have deceived the *birds*, but *I* have deceived the *painter!*"

His picture was a *curtain!*

"Capital!" exclaimed the visitor, laughing. "But in this case you have neither deceived bird or painter. This is only a shadowy semblance of something either real or imaginary. I fancy it is the latter, for nothing in life could be more perfect."

"Hush!" said the artist, with his finger on his lip, "some one is coming."

A knock at the door—the visitor retreated to the farthest corner of the room. An elderly gentleman and two ladies entered.

"Is it finished?" inquired the elderly gentleman.

"It is, sir; and I hope you will find it a correct likeness."

"Beautiful! perfect; I do."

"Dear father, is it correct?"

"I tell you, my child, it is perfect. Why it is your very self."

"On silver plate?"

"I don't care what its done on; it is the perfect likeness of my little girl. Don't you think so, Ellen?"

"I do indeed. Nothing could be better."

And Ellen paused to gaze upon the picture, meanwhile the visitor paused to gaze upon Ellen; for seldom had a more beautiful vision gladdened the eyes of mortal man.

> Her eyes' dark charm, 'twere vain to tell,
> But gaze on that of the Gazelle,
> It will assist thy fancy well.

The portrait of Ida was beautiful—very beautiful—but the living portrait of Ellen was far superior. There was a proud consciousness of beauty in the manner of Ida, and she turned her haughty head continually round, as if to ascertain from the manner of those around her whether her charms were sufficiently appreciated. Ellen, on the contrary, seemed to shrink as far as possible from notice, and Edward Harrison, the visitor at the Artist's, longed, but longed in vain, to meet the soft glance of her eye; and when she spoke, the low sweet tones of her voice thrilled to his soul.

"If Miss Warren would consent to sit, I should be happy to take a likeness of *her* also," said the artist glancing at Harrison, and perceiving the impression that the young lady had made upon him.

"Do, Ellen, do;" said Ida; "and we'll compare the two, and judge which is the best."

"Oh no, no, I cannot sit," replied Ellen with much embarrassment.

"Poh, poh, child," said the gentleman; "if you want the picture, have it done, I'll pay for both. Do as Ida wishes you."

"He believes you are hesitating about the price," said Ida in a rather loud whisper, "But he won't mind such a trifle. So have it done, if only for my sake. I want to see which will be the handsomest—" a toss of the head evinced that the young lady feared no rivalry as to beauty—"besides, you can give it to Edgar if you don't want it yourself."

The crimson mounted to the brow of the fair Ellen, but whether from the open allusion to her poverty, or the latter part of the young lady's remark, Harrison could not divine.

Meanwhile, the daguerreotypist, (to whom we will give the name of Moreland,) was very busy in arranging his stand and the apparatus necessary for the commencement of the picture, and occasionally glancing toward his friend as the conversation proceeded. There was a meaning in that glance, which strongly excited the curiosity of Harrison, and determined him to see the end of the affair.

In spite of all the remonstrances of Ellen, she was obliged to yield to the solicitations of her friend, and seating herself in the chair, the picture was soon completed, and subjected to the criticism of those present. Ida said it was too *dark*—her father decided that the *position* was not good, and Mr. Moreland, for the first time directing their attention to the silent visitor remarked, "Here is a gentleman in whose judgment I place entire confidence. Allow me, Mr. Jones, to introduce you to Mr. Harrison, a connoisseur in the arts, but disinterested enough to speak his mind candidly upon the merits or defects of a picture.

Mr. Jones and Mr. Harrison saluted each other. "Please come where we can have a better light if you please, Mr. Harrison" said Moreland; and then added in a low tone of voice. "Speak out, you will not offend me."

"My dear fellow—I understand. I am going to *abuse* the picture for this reason; I want you to take another of the same sweet face and give *me* this,—or sell it at any price."

"I am sorry to say Mr. Jones, that we do not entirely agree upon the correctness of the portrait. Will Miss Warren do me the favor to sit again?"

The first picture was laid aside as if useless, yet it was contemplated with eagerness by one person who quietly possessed himself of the rejected image, and was already "gone ages in love" with the original. At length all parties expressed themselves satisfied. Ellen received the daguerreotype with many thanks and blushes; Ida was in ecstacies and declared she should give it to no one else, but keep it herself. Mr. Jones pompously paid the bill—patted his handsome daughter on the cheek, and told Ellen to put on her bonnet as quick as she could, as he was in a hurry to get to Wall-street. Harrison met the glance of the dove-like eyes, as the latter stood before the mirror, and then the trio vanished like a fairy dream.

The artist's visitor drew a long sigh, and then turning to Moreland, (who was quietly watching his movements, as he held the treasured plate in his hand,) said, in an abrupt tone.

"Moreland, who is that divine creature?"

"Miss Jones."

"Miss Jones! hang the name—I hate it—no, the other."

"A poor relation."

"I thought so."

"You seem very much interested in a poor relation."

"Poor! what do I care. I'm rich. I would not marry a rich girl if she were a Venus."

"Well, really, Ned, you are going on at steamboat pace. Marry! Have you jumped to the conclusion of marrying a girl you have seen for only half an hour?"

"And why not?"

"For more than one reason. Firstly, it is said that she is engaged."

"Engaged! to whom?"

"Ida's brother"

"Ay, Edgar; she called somebody Edgar; yes, it must be him. Hang Edgars and Jones—Where does she live? I *must* see her again."

"But you know nothing about her."

"*You* do: so tell me."

"She is an orphan, as I said before. Her parents married against the wish of their relations. They died. There is a mystery about the whole which I cannot fathom. Ellen, their only child, was taken home by the rich Mr. Jones, and proud and aristocratic as he is, he is trying to bring about a match between his only son and the dependant orphan. Solve the riddle if you can."

"I see, I see it all," exclaimed Harrison, starting up, and clapping his hands. "The old hunks has got hold of his niece's money, (if she has any,) and now wants to do what he pleases with her. Moreland, I'm off to investigate. Don't fear me. I'll tell nothing. But if I can only obtain the hand and heart of that girl the dragon of an uncle is welcome to her money."

"But she may not have any."

"So much the better. The uncle cannot refuse a rich nephew; and if his gracious son wants a rich wife—why there's Em, you know, dying to set up an establishment for herself, and as she has no heart to break for dissappointed love, and only wants a husband to protect her, I'll bring her on the tapis, and the whole affair is settled."

"Oh yes, of course," replied Moreland. But all this time you are neither considering whether your sister will agree to the bargain, nor whether Miss Warren's affections are placed upon another. For instance—why should not *I* be a competitor? She is the most amiable creature I ever saw."

"The deuce! and are you my rival?"

"No, indeed; Mr. Harrison, I was only in jest. I am poor, and you are rich; but of all created beings she would be my choice were I able to marry. Look here."

He took from a private drawer a beautiful enamelled case—opened it.— and displayed to the astonished view of Harrison, an exact counterpart of the likeness he had taken that day. "This was taken without knowledge of the original" said he, "and when I wish to gaze on a face and form as perfect as ever came from the hands of the Creator, I take out this, and muse upon it in my solitary moments."

Harrison gazed upon the flushed face of his friend, and an idea, at first faint and vague, but now confirmed, flashed through his brain; Moreland himself loved the beautiful form he had impressed upon the silver plate, in shadowy, but to his heart, imperishable colors!

There is a generosity which is displayed in doing acts of charity, and in sometimes sacrificing one's comforts to effect it, but this does not touch materially upon the feelings. The charity is bestowed, but we do not become more unhappy in consequence; but when the *heart* is interested—the sacrifice is doubly meritorious. There was a silence of a few moments between the two friends—then Harrison spoke.

"Moreland, you are a queer fellow! Why did you allow me to get headlong into a scrape? So you are acquainted with this paragon. You are interested in her yourself, and yet you put the temptation in my way."

"You are very ready to jump to conclusions," replied his friend. "I have not the least idea that Miss Warren regards me in any light but that of a professional artist. She has frequently called at my rooms with friends, and while she gazed round in evident admiration of the works of art with which I have endeavored to adorn them, she paid little attention to my humble self. Like you I was the victim of a first impression. Miss Ida Jones pleases the *eye*—Ellen Warren wins the *heart*. 'Tis a poor simile between the two pictures of the fruit and the curtain—but adapt it as you please. Now, friend Harrison, let us start fair in the contest, *I* am poor, *you* are rich. She also, I fear is poor. If *you* win, I shall not repine—If *I* —— but no—that can never be!"

"And why not?" asked Harrison, whose better feelings were fast gaining the mastery.

"Why not!" exclaimed the artist, walking the room in a highly excited state. "What have I to offer her but the poor pittance procured from day to day by such persons as Mr. Jones? If she *is* poor, she has doubtless been reared with tenderness and care. *I* ask *her* to share the poor pittance sufficient for *my* wants! Imagine her seated in these rooms waiting for the money received for a picture to purchase our dinner for the day! or, or,

a thousand other deprivations I cannot mention! No, go on in your wooing if such be your intention. I will not interfere. But how will you obtain access to their house?"

"To the rich and insolent, it is said, all thing are easy;" replied Harrison in a calm tone of voice. "I have no doubt of being able to accomplish all my wishes, if I attempt it by the means of *gold*. Yes,—all, but the *affections*—" (seeing Moreland start back in disgust) and "perhaps even those may be won."

"Not Ellen Warren's" replied Moreland.

"There is no harm in trying," said Harrison, coolly tipping his chair and pretending not to see the flushed countenance of his friend which, however, was plainly discernible in a mirror opposite. They soon after separated with some bitter feelings on one side but a secret exultation arising from some cause in the heart of the other.

———

"Who do you consider the most beautiful woman in New York?" asked a young gentleman of Harrison, a few months after.

"Mrs. Moreland."

"What the wife of the artist. What was her maiden name?"

"Ellen Warren."

"What the niece of rich old Jones? How did he manage to get *her*?"

"A sympathising friend may sometimes do wonders," replied Harrison.

From the London Art-Journal.

ON THE APPLICATIONS OF SCIENCE TO THE FINE AND USEFUL ARTS.

THE STEREOSCOPE.

THERE are few subjects which have elicited more attention from philosophers than the phenomena of vision, and several theories have been promulgated which attempt to explain the very remarkable condition of single vision with a pair of eyes.

The eye is a singularly beautiful piece of mechanism, most perfectly adapted for enabling us to acquire correct knowledge of the creations by which we are surrounded. This matchless organ is of nearly a spherical form, there being a slight projection in front. The eyeball consists of four membranous coats: the *sclerotic* coat, constituting the white of the eye; the *cornea*, which is the clear and transparent coat which forms the front of the eyeball; the *choroid* coat, a delicate membrane lining the inner surface of the *sclerotic*, and covered on *its* inner surface with a black pigment; and the reticulated membrane formed by the expansion of the optic nerve, the *retina*, which is the innermost coat of all. Looking through the cornea from without, we perceive the *pupil* of the eye, an opening formed in the colored membrane within, and nearly in the centre of the cornea. This pupil is adjusted so that it expands or contracts as the quantity of light falling on the eye is diminished or increased. The coats of the eye enclose the *aqueous humor*, *vitreous humor*, and the *crystalline humor*, the last having the form of and acting as a lens. Such are the important parts of the eye; for a more minute descripti n of its structure we must refer our readers to Brewster's and other treatises on optical science.

As in the camera-obscura the image of an external object is seen after the rays proceeding from it have undergone refraction by the lens, inverted on the screen; so the radiations passing through the cornea and the crystalline lens give *inverted images* of any illuminated external objects upon the retina of the eye. It has long been a subject of anxious dicussion and experiment to prove the above fact, and to account for the circumstance that we see images erect. If we cut open a portion of the eye of a recently killed animal, and look

in upon the retina, we shall have at once a proof of the inversion of the image there formed. Some authors have attributed the correction to an operation of the mind, and others contend that the adjustment is effected upon purely optical principles explained by the law of visible direction, for which we must refer to any of the best treatises on the science.

Another question has arisen from a consideration of the fact that we have two eyes, that those eyes are at a certain distance from each other, and therefore that the two images formed on the retina cannot be exactly similar, and yet we see a single object in its length, breadth, and thickness.

No one has contributed more towards the elucidation of this question than Professor Wheatstone, to whom we are indebted for the invention of the beautiful instrument we are about to describe—the Stereoscope.

"The theory which has obtained greatest currency," says Professor Wheatstone, "is that which assumes that an object is seen single because its pictures fall on corresponding points of the two retinæ; that is, on points which are similiarly situated with respect to the two centres, both in distance and position. This theory supposes that the pictures projected on the retinæ are exactly similar to each other, corresponding points of the two pictures falling on corresponding points of the two retinæ."

It is not a little interesting to find that Leonardo da Vinci, in his "Trattato della Pittura," has made some remarks on the peculiarities of vision, which bear in a very singular manner on the phenomena of the stereoscope—to the effect, that a painting, though conducted with the greatest art and finish to the last perfection, both with regard to its contours, its lights, its shadows, and its colors, can never show a relievo equal to that of natural objects, unless these be viewed at a distance, and with a single eye; for if an object, as an orange, be viewed by a single eye, all objects in that space behind it in which we may suppose to be included in its shadow, are invisible to that eye; but open the other eye without moving the head, and a portion of these become visible, those only are hid from sight which are included in the space covered by the two shadows formed by two candles, supposed to be placed in the position of the eyes. The hidden space is so much the shorter, according to the smallness of the object, and its proximity to the eyes. On this Mr. Wheatstone remarks—"Had Leonardo da Vinci taken instead of a sphere, a less simple figure for the purpose of his illustration,—a cube, for instance,—he would not only have perceived that the object observed from each eye a different part of the more distant field of view, but the fact would also have been forced upon his attention, that the object itself presented a different appearance to each eye." It was first shown by Professor Wheatstone that if two such images were drawn, and so placed that the left-hand image was viewed by the right eye, and the right-hand image by the left, an image of three dimensions would result. In the *Art-Journal* for 1850, p. 49, will be found a description and drawing of the Phantascope, by Professor Locke, which involves many of the conditions under consideration. To exhibit this in the most perfect manner, Professor Wheatstone invented the stereoscope, a compound term, signifying "solids I see," from its property of representing solid figures, a modified form of which is represented in the accompanying woodcut.* The instrument consists essentially of two plane mirrors, so adjusted that their backs form an angle of ninety degrees with each other. These mirrors are fixed by their common edge upon an horizontal board, in such a manner that upon bringing it close to the face, each eye sees the image in a different mirror. At either end of the board there are panels in which the drawings are placed. The two reflected images coincide at the intersection of the optic axes, and form an image of the same apparent magnitude as each of the component pictures.

The accompanying figures are two circles at different distances from the eyes, their centres in the same perpendicular, forming the outline of the frustum of a cone. If a cone is placed before the observer with its apex towards him, he will find that its outline will resolve itself to the different eyes into two such images as those represented.

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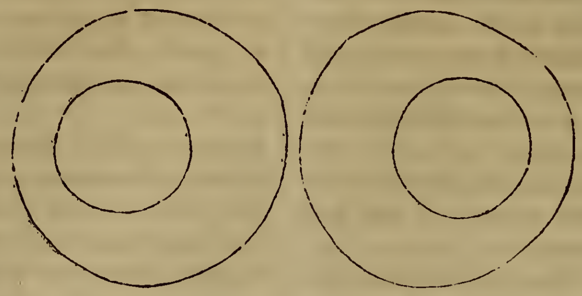
* See Vol. 3, No. 3, p. 176, Phot. Art-Jour.



If we select any building such as a gateway and examine the conditions as viewed first by the right and then with the left eye, we shall find that two such images as the following will be produced.*

Such images as these placed upon the panels of the stereoscope, and viewed in the mirrors, give rise to an impression of one solid image. This explanation will render the construction of the drawings for the stereoscope sufficiently intelligible for most of our readers. Those desiring fuller information should consult the original memoir of Professor Wheatstone in the Philosophical Transactions—and, as soon as possible, the admirable continuation of the subject in the Bakerian lecture of the present year.

Sir David Brewster has recently published in the Transactions of the Royal Scottish Society of Arts, *an account of a binocular camera, and of a method of obtaining drawings of full length, and colossal statues and of living bodies which can be exhibited as solids by the stereoscope.* This memoir contains so much that is important to the artist that we shall quote extensively from its pages.

"In order to understand the subject," says Sir David Brewster, "we shall first consider the vision with one eye of objects of three dimensions, when of different magnitudes, and placed at different distances. When we thus view a building or a full length or colossal statue at a short distance, a picture of all its visible parts is formed on the retina. If we view it at a greater distance, certain parts cease to be seen, and other parts come into view; and this change on the picture will go on, but will become less and less perceptible as we retire from the original. If we now look at the building or statue from a distance through a telescope, so as to present it to us with the same distinctness, and of the same apparent magnitude as we saw it at our first position, the two pictures will be essentially different; all the parts which ceased to be visible as we retired will still be invisible, and all the parts which were not seen at our first position, but became visible by retiring, will be seen in the telescopic picture. Hence the parts seen by the near eye, and not by the distant telescope, will be those towards the middle of the building or statue, whose surfaces converge as it were towards the eye; while those seen by the telescope, and not by the eye, will be the external part of the object whose surfaces converge less, or approach to parallelism. It will depend on the nature of the building or the statue, which of these pictures gives us the most favorable representation of it.

"If we now suppose the building or statue to be reduced in the most perfect manner, to half its size for example, then it is obvious that these two perfectly similar solids will afford a different picture, whether viewed by the eye or by the telescope. In the reduced copy, the inner surface visible in the original will disappear, and the outer surfaces become visible; and as formerly, it will depend on the nature of the building or the statue, whether the reduced or the original copy gives the best picture. If we repeat the preceding experiments with *two eyes*, in place of *one*, the building or statue will have a different appearance; surfaces and parts, formerly invisible, will become visible, and the body will be better seen because we see more of it; but then the parts thus brought into view being seen, generally speaking, with one eye, will only have one half the illumination of the rest of the picture. But, though we see more of the body in binocular vision, it is only parts of vertical surfaces perpendicular

* See No. 3. Vol. 3, p. 176 Phot. Art-Jour.

to the line joining the eyes that are thus brought into view, the parts of similar horizontal surfaces remaining invisible, as with one eye. These observations will enable us to answer the question whether or not a reduced copy of a statue, of precisely the same form in all its parts, will give us, either by monocular or binocular vision, a better view of it as a work of Art, * * * This will be better understood if we suppose a sphere to be substituted for the statue. If the sphere exceeds in diameter the distance between the pupils of the right and left eye, or two inches and a half, we shall not see a complete hemisphere, unless from an infinite distance. If the sphere is larger, we shall only see a segment, whose relief, in place of being equal to the radius of the sphere is equal only to the versed sine of half the visible segment. Hence it is obvious that a reduced copy of a statue is not only better seen from more of its parts being visible, but it is also seen in stronger relief."

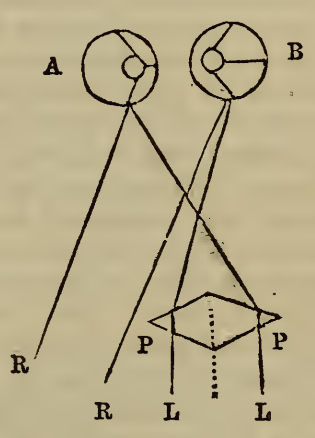
Sir David Brewster then remarks:—

"Were a painter called upon to take drawings of a statue as seen by each eye, he would fix, at the height of his eyes, a metallic plate with two small holes in it, and he would then draw the statue as seen through the holes by each eye. These pictures, however, whatever be his skill, would not be such as to reproduce the statue by their union. An accuracy, almost mathematical, is necessary for this purpose; and this can only be obtained from pictures executed by the processes of the Daguerreotype and Talbotype. In order to do this with the requisite nicety, we must construct a binocular camera, which will take the pictures simultaneously, and of the same size; that is, a camera with two lenses, of the same aperture and focal length, placed at the same distance as the two eyes.

Such a camera could not be accurately constructed with two lenses, from the very extreme difficulty which would be found in grinding and polishing two lenses of exactly the same focal length. It is therefore proposed to cut either an achromatic or common lens in half, and fix those semi-lenses at the distance of two inches and a half a part. When fixed in a box of sufficient size, we obtain two images of any external objects, produced at the same time with the same lights and shadows, and such as will produce the requisite relief in the stereoscope.

The means of adjusting the lenses as to magnifying power will readily suggest themselves to any one constructing either the binocular camera or stereoscope. A very compact form of the latter instrument is shown in the following woodcut,* which is precisely similar to those constructed by M. Claudet, who also employs the binocular camera, and thus produces daguerreotype portraits and views, which cannot be surpassed for the beauty of their illusory effects.

The lenticular stereoscope, made in the manner described by Sir David Brewster, may be of any size, and the semi-lenses of any power, so that the range of the capabilites of the instrument is very great. The same experimental philosopher has described several other forms of the instrument.



The most curious is the prismatic stereoscope. A double prism, P P, is so adjusted, that, with the left eye, L, looking through the prism, P, we may place the refracted image, B, upon A, as seen by the right eye, R; we shall then see a *hollow* cone. But if, with the left eye, L, looking through the other prism, P, we place the refracted image, of A, upon B, as seen with the right eye at R, we shall see a *raised* cone. This experiment is an exceedingly curious one, and is suggestive of many interesting speculations on the phenomena of vision.

Robert Hunt.

* Vol. 3, No. 3, p. 175, Phot. Art-Jour.

THE DIGNITY OF OUR ART.

BY GABRIEL HARRISON.

EVERY art and every science have had their votaries, consecrating themselves to the great worth, and the peculiar beauties existing in them. Art has had its Fulton, Science its Newton, and Daguerreotyping its Daguerre, and with the latter, the morning of the new art dawned with a light as pure, as brilliant and far penetrating into the chaste and beautiful as ever radiated on earth from the old arts or sciences, and it is undeniable that it is intimately connected both with pure art and science, so much so, that it seems to set a seal upon the age of its discovery; as the sun itself marks the heavens, telling us in language strong as its own brightness, I am Lord of the day, and yet how few there are either in or out of the profession, who properly estimate its great importance. In fact, there are those connected with the art, who refuse to read a journal devoted to the science of the art, on the ground, that, because they understand the simple manipulation of daguerreotyping, there is nothing more for them to learn—good fortune save the profession from any more such philosophical gentry, for, in my opinion, they have not enough of the intellectual to discern the difference between a hawk and a hand-saw—that it requires the taste of an artist to be an operator of any merit, is conclusive from the decision, that all it creates is precisely that which every true artist desires to accomplish, the nearest resemblance to nature, or most faithful representation of the object to be portrayed. The painter draws with his pencil, while the daguerrean draws with the camera, and each instrument in unartistic hands will undoubtedly produce abortions; for if the painter is without the knowledge of the general rules of perspective we may expect faulty productions with their distorted proportions and bad lines, no matter how good the coloring may be or how effective the arrangement of lights and shades, and it will be disagreeable to look upon. The same rule holds good in daguerreotyping, as the correctness and pleasing lines depends entirely on the proper position of the camera towards the object to be taken, and it is from this fact, that we have so many complaints of daguerreotypes not looking like the person for whom they are taken. Operators seem to forget the immense distance to which the figure is thrown by means of the construction of the lens, also of the curvature of the glasses and the reflection of the image on a flat surface—the ultimatum looked for in a daguerreotype of a person is a strong likeness, and the proper position of the camera for such a result is to have the centre of the lens precisely opposite to the centre of the face at the same time taking care to have the position of the head as near plumb as possible, and if the glasses are purely achromatic the proper degree of reach and field, the likeness must be perfect. For instance, place the centre of the lens as high as the top of the head, and so as to get the face to come into its proper place on the plate by pitching the tube downward; and, behold, the imperfect likeness that will be produced; the top side of the lens beyond the centre being nearest to the forehead, that part of the face will undoubtedly be the largest and most disproportional to the nose, mouth, and chin. In taking a full length figure, to obtain good drawings or good proportions of the whole, the same rule must be observed, by placing the tube opposite to the centre of the body; but, in such a case, it would not be prudent, for in so doing, we get a full view of the nostrils, which is not a very pleasant feature; therefore, it would not be advisable to sacrifice a beauty in the face to any other part of the body, for it is with this as it is with many other things, "of the two evils choose the least." Beside inaccuracy of drawing to those who have pictures taken for the sake of the likeness, is far less observant in the body than it would be in the face.

Another evidence of the relativeness of photography to pure art is, that the

operator must observe all of the identical rules necessary for the production of a work of merit that a painter or sculptor would follow to secure graceful position, proper distribution and degree of light and shade, also tone of picture, arrangement of drapery, &c. As to daguerreotyping partaking strongly of science, who dares to deny it, if they understand any part of the art or the definition of the word, which means "a collection of general principles on any subject, as a branch of knowledge depending on speculative principles rather than on practice," for you may be a daguerrean for fifty years, and there will hardly be a week in that whole space of time but what something will turn up in your operations eluding all your philosophy and years of experience. For one moment look at the thousand chemical freaks under the influence of atmospheric changes, the chemical action of colors differing in degree of tint on the plate, in proportion to the peculiar powers of the fabric for absorption and refraction of light. A hundred other things could be mentioned, and, in fact, it is a perfect world of science, and you cannot look upon anything in nature without being reminded of some peculiar and beautiful result if daguerreotyped; even the small blade of grass, the little yellow butter-cup that in genial spring spangles o'er and makes more lovely the face of nature; the blue jay that sports in endless space; the umber colored eagle that makes his course against the blazing sun as if it were his natural home and the nestling of his young. In taking this view of the art,—and beyond all doubt, it is the just one—it is not surprising that there should be so many in the profession so little calculated to carry it on with that taste and dignity that its thousand meritorious parts demand. What we mean by the dignity of the art, is that pride and appreciation of it which the proper class of men who properly estimate the many beauties existing therein will make apparent, causing the public to look upon it with a higher estimate than that of merely requiring on the part of the operator nothing more by way of qualification, than the mere capacity to drive a nail into a board or place a lamp under the mercury bath. There must be a cause for the introduction of persons so unworthy the profession, and the parasite should be cut and rooted from the vitals of the new being before the sickly fibres entwine themselves too closely, causing decay and premature death to the discovery that has placed upon the brow of the discoverer a never-fading wreath. The first cause that has had the tendency to destroy the high position which photography should hold, is the fact of the very low price asked to communicate the art to others, so low that the lowest are always in possession of sufficient means to obtain instruction, and an ignoramus can be taught the manipulation in six hours, and will, perhaps, occasionally by accident produce a fine picture or two, thereby making for himself something of a reputation, as the individual will take great care to have always in his pocket the identical and only good picture he ever produced to hawk about as a sample of work equal to that of our best artists; Brady, Morand, Gurney, Root, Whipple and others. This then being one of the great causes that keeps the art from its proper elevation in the minds of the people or persons of letters. It now behooves those in the art, and who really know something of its merits, to put up immediately the price for instruction, to that standard which will demand the attention of men of capital, talents and respectibility and that will hereafter encircle the new discovery with that tone and dignity to which it is rightly entitled.

A specimen of some of the men now engaged in the art, may be gathered from the following advertisement which is cut from the New York Herald of the 5th of February, 1852:

"Wanted, Fifty young men to learn the Art of Daguerreotyping. Instructions given in a few days, and a whole set of apparatus furnished for fifty dollars. Direct, 'Broadway Post Office,' will meet with immediate attention."

This was some poor creature, undoubtedly, who knew very little about the art, and who was on his last legs in consequence, and thus made his last dive at Daguerreotyping, and we will venture to say, he jumped higher, went deeper, and came out dryer, than any other man who has ever had anything to do with what such men elegantly term "Dog-a-ror-typing." However, I am sorry to say, that this Sam

Patch of the art does not stand alone, he has a fit competitor in an operator of this city, who told me but a few weeks since, that he was going to "advertise for a class of one hundred persons to whom he would give instructions for *Five Dollars* per head." I gave him my opinion of such a transaction in round terms, and I believe he had sufficient of moral suasion in him to deter him from his intended dishonorable course. The matter does not end with these last instances. A great error exists at the present time in some of our first establishments in Broadway; men, who, if they choose, could be ornaments to society, and be looked upon as men of art and science, if they conducted their operating departments in a proper manner, by having the right sort of men for operators, and paying a sufficient salary that would induce men of artistic taste to embark in the profession, and not take their illiterate plate cleaners, whenever a rush of business occurs, from their work-bench, and in shirt-sleeves attempt to take a picture of a lady in a room beautifully furnished with Brussels carpets and marble top-tables, as has frequently been the case under my own observation during the few months past. We have heard of falls from the sublime to the absurd, but a better illustration of the respectable and the vulgar could not be given. Such conduct is disgusting, and its practice is the principal cause for my dedicating these few feeble lines to the Daguerreotypists of our beautiful art; with the hope that what I have said on the subject will be thought to have been actuated by a kindly feeling, to correct an abuse, which will in the end wound those the most who practise it; rather than with a disposition to find fault with those who might be an ornament to the profession and help to keep it in its own natural sphere, *the very centre of the noon-day sun.*

PHOTOGRAPHIC MANIPULATION.*

Part II.

CONTAINING THE THEORY AND PLAIN INSTRUCTIONS IN THE ART OF PHOTOGRAPHY, OR THE PRODUCTION OF PICTURES THROUGH THE AGENCY OF LIGHT.

BY ROBERT J. BINGHAM,

Late Chemical Assistant in the Laboratory of the London Institution.

WITH ALTERATIONS BY THE EDITOR.

IF the double salt of gold be used, 15 grains of it are to be dissolved in a pint of distilled water. But if the crystallized chloride of gold and hyposulphite of soda are obtained separate, the 15 grains of the former are to be dissolved in a pint of distilled water, and in another pint of distilled water 45 grains of the latter; pour gradually, in very small quantities, the gold in to the hyposulphite, stirring the solution all the time, when finished the mixture should be nearly colorless, the plate being removed from the distilled water in which it was placed, and whilst still wet, should be placed on a fixing stand. A little filtering paper is then to be placed in the glass funnel, and the gold solution poured into it, and allowed to drop on the plate. As much solution should be placed on the plate as it will hold: should it not be level it is adjusted by the levelling screws. A small spirit lamp flame should then be applied to the under surface of the plate, and kept in motion, so as to heat all parts of the plate alike. Small bubbles will form, and

* Continued from vol. 3, No. 3, p. 188.

the image will assume a dark appearance; presently the picture will brighten, and a great intensity of light and shade will be produced, the gold should then be poured off, and the plate well washed with distilled water it now only requires drying.

75. The apparatus (fig. 4.) may be used for this purpose. *a* is a vessel of sufficient size to take the the largest plate, but not more than half an inch in width; it is best made of copper or brass, tinned or plated inside, which must be kept perfectly clean; hot distilled water is poured into it, and the temperature kept up by the spirit lamp. The plate supported by the holder *c* is immersed and then gradually withdrawn, at the same time the operator should blow gently upon the surface, it may by this method be brought out perfectly dry. Small plates are readily dried, by holding them by one corner with the pliers, and pouring hot distilled water on them applying the spirit lamp to the back at the upper corner, at the same time facilitating the operation with the breath, passing the lamp gradually downwards, finishing at the extreme corners. The last drop may be removed by a little bibulous paper, the film of water must dry off evenly, and leave no drop behind on the surface, for this would infallibly cause a stain which it would be difficult to remove; should a drop separate from the rest, it is better to return the plate into clean water, and commence again the drying operation; if the plate be quite clean, there will be no difficulty in drying off the picture, but if there is the smallest quantity of grease either on the plate, or in the water, or communicated by the fingers, it will be impossible to get the water off properly, the only plan to adopt in this case is to pour over the plate a little strong alcohol, and *slightly* wipe the plate at the same time with a camel's hair pencil: the alcohol should then be washed off with water until no stain appear on the plate, and then another attempt made to dry the picture. The proof is now finished, and in order to preserve it, should be put into a plat-box, and kept from the air, or it may at once be mounted in a paper or other frame, of which several varieties may be obtained. An old picture injured or stained by exposure to air, may very often be cleaned by washing it in a solution of the cyanide of potassium, at the same time passing a soft camel's hair pencil over it; it should then be washed and dried as before (§ 74)

76. It is often an advantage to use the gold solution of one-half the strength before recommended, there is less risk of the film of gold becoming too thick and breaking up, as is often the case when the heat is continued too long; another advantage is, that it enables the operator to "*glid down*" a stain which often appears at the beginning of the gilding process; for by continuing the heat there is very little danger of the exfoliation of the gold, and the stain very often disappears; the operator will soon discover the kind of stain which will disappear by continued gilding; if there are any traces of oil left in the plate by the cleaning process, white stains will appear, these cannot be got rid of by containing the gilding, they get worse, and if they appear, it is very little use proceeding farther with the proof, for it will only render it more difficult to clean.

77. Solarization may often be removed by long application of heat, using weak gold; but a better plan for removing slight solarization, is to deposit a *thin* film of silver upon the plate by means of the galvanic battery, the conducting wire from the zinc end of the battery should be connected with the daguerreotype plate, the opposite silver electrode placed in the solution, and when all is ready the plate is to be dipped into the silvering liquid for about two seconds only, if left in the solution longer than this time, a thick film will be deposited, and the proof clouded. (full directions for electro-silvering will be found in Electrotype Manipulation, published in vol. 2, Photo. A.-J.). After the plate has received this silver coating, it should then be gilded as before described; if carefully managed, this will be found a very good method of removing solarization.

78. The gilding can be accomplished by electricity, and this gives a very warm tone to the picture, this plan may be used by the artist to modify his results. Mr. Beard fixed all his proofs in this way at one time, but we believe he has now abandoned the plan.

79. *Coloring Daguerreotypes.*—It has often been asserted that this has been accomplished by solar influence alone, but we think without any foundation. All the

coloring in dagaerreotypes is applied by the pencil. For this purpose, the artist will require a few colors in the state of an impalpable powder, having been ground up with a little gum-arabic and spirits of wine, and then dried. The principle colors used are ultramarine, carmine, chrome-yellow and Prussian blue. A little of the color should be taken up on the point of a fine camel's-hair pencil, and applied by a slight circular motion to the parts we wish to tint, which should then be breathed upon, and the superfluous color dusted off by a thicker camel's-hair pencil. If the color is not deep enough, a little more of the powder should be applied, and the plate again breathed upon and dusted off. By combining these colors, any tint we wish may be obtained; any *slight* lines or *spots* of color may be applied in the wet state, in the same way as ordinary water-colors; but only a *very small* quantity should be used. The general fault with amateurs is, that they use too much color—but, unless in very skilful hands,* we think a colored daguerreotype is a spoilt one: it is something analogous to painting a fine engraving.

80. We have some doubts as to the propriety of noticing the following process for coloring daguerreotypes, proposed by Professor Page of New York:—†

"The impression being obtained upon a highly polished plate, and made to receive by galvanic agency a very slight deposit of copper from the cupreous cyanide of potassa (the deposit of copper being just enough to change the color of the plate in the slightest degree), is washed very carefully with distilled water, and then heated over a spirit-lamp until the light part assumes a pearly, transparent appearance. The whitening and cleaning up of the picture by this process is far more beautiful than by the ordinary method of fixation by a deposit of gold. A small portrait, fixed in this way more than a year since, remains unchanged. As copper assumes various colors, according to the depth of oxidation upon its surface, it follows, that if a thicker coating than the first mentioned can be put upon the plate without impairing the impression, various colors may be obtained during the fixation. It is impossible for me to give any definite rules concerning this last process; but I will state, in a general way, that my best results were obtained by giving the plate such a coating of copper as to change the tone of the picture—that is, give it a coppery color, and then heating it over a spirit-lamp until it assumes the color desired. I have now an exposed picture treated in this way at the same time with the two above mentioned, and it remains unchanged. It is of a beautiful green color, and the impression has not suffered in the least by oxidation. For pure landscapes, it has a pleasing effect; and by adopting some of the recent inventions for stopping out the deposit of copper, the green color may be had whenever desired. In some pictures a curious variety of colors is obtained, owing to the varying thicknesses of the deposit of copper, which is governed by the thickness of the deposit of mercury forming the picture. For one instance a clear and beautiful ruby color was produced limited in a well defined manner to the drapery, while all other parts were green. To succeed well in the first process, viz. that for fixation and the production of the pearly appearance, the impression should be carried as far as possible without solarization; the solution of the hyposulphite of soda should be pure and free from the traces of sulphur, the plate should be carefully washed with distilled water, both before and after it receives the deposit of copper—in fact, the whole experiment ought to be neatly performed, to prevent what the French significantly call *taches* upon the plate, when the copper comes to be oxidized."

81. *Electro-Silvering the Plate.*—In order to insure a perfectly pure surface of silver, many operators deposit a thin film of silver on the plate by the galvanic battery. This is a good plan, but adds a little to the trouble of the operation; it is well-paid for in the superior brilliancy of the proofs obtained from these electro-silvered plates. The apparatus necessary is represented at Fig. 5, where A. represents the battery, and B the depositing cell; the battery is to be charged with a mixture of eight parts water, and one part

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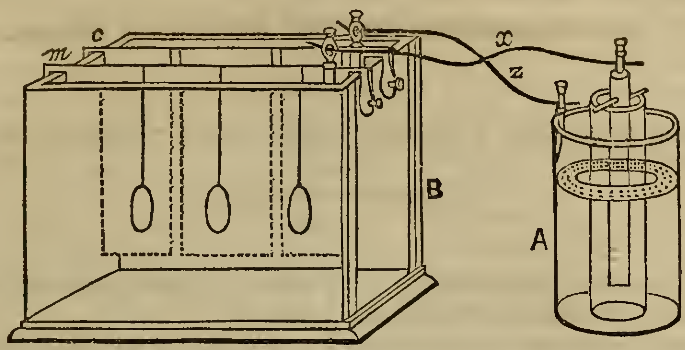
* M. Mansion, a very clever artist, has however succeeded in producing some very fine colored daguerreotypes.

† Silliman's Journal of Science.

Fig. 5.



of sulphuric acid ; and the depositing cell B is filled with a solution made as follows : Dissolve two ounces of cyanide of potassium in one pint of water, and then add half an ounce of oxide of silver ; as soon as this is dissolved the liquid is ready for use. A piece of silver foil should be placed in the decomposition cell, and connected by means of a wire with the binding screw attached to the platinized silver of the battery ; another wire with a clip at one end to hold the plate, is attached to the zinc pole of the battery. The plate to be silvered should be carfully cleaned and polished (11), and attached to the small clip, then quickly plunged into the silvering cell opposite to the silver foil ; after remaining in for about ten seconds, it will have received a sufficient thickness of the deposited silver ; it should then be taken out and rinsed in a little clean water, rubbed with cotton-wool and a little tripoli and then polished with the buffs, as described (§11), it is then ready for the iodizing process (§ 21.)

82 All the different processes necessary to produce a perfect daguerreotype have now been described: upon several points we have dwelt at some length, even at the risk of being tedious ; however, as we intended this little work to be a *practical*, and, as far as possible, a *complete* manual of this new and increasingly interesting art, we may, perhaps, be excused if we have insisted and enlarged upon matters which, if not altogether interesting to the practised manipulator, are yet quite important and necessary to be known to a beginner in the art.

— As we are frequently obliged to make use of the French terms for weights and measures, we give our readers the benefit of the following table, kindly furnished us by Mr. C. A. Johnson:

FARADAY'S COMPARATIVE TABLE OF ENGLISH AND FRENCH WEIGHTS AND MEASURES.

	Grs.		Grains.
1 Pound Averdupois,	7000.	Gramme,	15.4063.
1 Ounce "	437.5.	Decigramme,	1.5406.
1 Pound Troy,	5760.	Centigramme,	0.1540.
1 Ounce "	480.	Milligramme,	0.0154.

	Inches		Cubic Inches	
Yard	36.	Imperial Gallon	277.274.	70000.
Metre	39.37079.	" Pint	34.65925.	8750.
Decimetre	3.93708.	" Ounce	1.7329625.	437.5.
Centimetre	0.39370.	Cubic Inch	1.	252 458.
Millimetre	0.03937.	Litre	61.02525.	15406.312.
		Decilitre	6.10252.	1540.631.

EXPERIMENTS ON THE COLORED FILMS

FORMED BY

IODINE, BROMINE, AND CHLORINE, UPON VARIOUS METALS.

BY AUGUSTUS WELLER, M. D.

IN a paper presented by me to the Academy of Sciences of Paris, an extract from which may be seen in the *Comptes Rendus* for October 5, 1840, I first demonstrated the error committed in ascribing to the iodide of silver alone the power of fixing the vapors of mercury, after it had been exposed to the action of light.

Instead of this property being exclusively confined to a film of iodide of silver, as obtained in the process of M. Daguerre, I found that it existed in many other substances when presented to the action of light in the state of thin films, viz. by the bromide and chloride of silver; by the oxide, bromine, iodide, and chloride of copper, and some others; all these, however, possessing less sensibility than the iodide of silver of Daguerre, and therefore less available for the reproduction of the images of the camera than the compound originally discovered by that gentleman. The iodide of Daguerre was found already too little sensitive to the influence of light in this climate, especially when applied to the reproduction of the image of animal objects so that those films discovered by me seemed still less suitable to be employed for that purpose; this objection has, however, been completely removed by recent improvements, more particularly those of M. Claudet, who effected this principally by combining the original discovery of Daguerre with those mentioned above as having been subsequently made by myself Pursuing the first stage of Daguerre's process, he obtained the film of iodide of silver, and added to this another film of bromide, either in a simple state,—as practised in my experiments published more than six months before—or after two of these substances had been combined together; as the chloride of iodine and the bromide of iodine, which he was the first to employ.

These colored films, however, merit attention independently of the purposes to which they may be applied in photography: the beauty of some of the phenomena themselves is peculiarly attractive; the numerous changes of color they undergo, either by a variation in the thickness of the film, or by the action of light, assign them a place among the most curious facts of science, and the extreme facility with which they are obtained adds to the interest they excite.

Impressed with these ideas, I was induced to pursue a train of investigation on this subject; among the results of which one of the most interesting was a new method of making colored rings, like those generally known under the name of "Newton's colored rings," on many of the metals, by the same chemical process as that employed for forming the films of uniform thickness in photography. In order to procure these colored rings, and at the same time to show the identity of the origin of the colors with those of the ordinary transparent films, that is, as residing simply in the thickness of the lamina and not dependant on the ordinary cause of color, we have but to place a piece of iodine on a well-polished surface of silver or copper, and in a short time we find around the iodine a series of colored zones of the various tints of the spectrum, and approaching in a greater or less degree to the form of a circle, according as they have been more or less disturbed in their formation by currents of the surrounding air. In order that they may be perfectly regular, as large as possible, and with tints undisturbed by the action of light, it is necessary to place a piece of iodine in the centre of a well-polished plate as before described; this is then to be shaded by an opake screen superimposed a few lines from the sur-

face to cause the vapors which would otherwise ascend and partially escape, to expand over its silver surface. Colored rings may be formed in the same manner by bromine and chlorine and the various combinations of these bodies with each other, except that for those that are gaseous or liquid it is requisite to pay a little attention to the manner of disengaging them on the surface of the metal, either by passing them through a glass tube, or by some other contrivance easy to execute.

These rings correspond to those formed by reflected light in Newton's experiments, with this difference, however, that in the colored films of the soap bubble, and in those formed by the glass lenses, the thinest film is in the centre; whilst in these rings, obtained by chemical action, it exists at the circumference, as is the case with the colored rings of Nobili. In watching the formation of these phenomena, at first are seen two or three very small circles, which appear almost as soon as the iodine and the metal are placed in contact with each other; as the experiment continues, the circumference of these circles become gradually greater; whilst the external colors extend themselves over a great space, those of the centre grow fainter; red and green now only remain visible, and these at last, when the film has attained a certain thickness, in their turn also give place to a dull coating of brown.

The formation of these rings evidently depends on the vaporization of the iodine from the solid nucleus. The variety in color and extent of these zones is caused by the difference between the strength of the vapor at the centre and the circumference of the iodic atmosphere whilst expanding over so large a surface. In the metal thus combining with the vapor, we have to consider,—1, the force of the vapor of different distances from the centre; 2, the obstacle which a film of iodine, once formed, opposes to any further action between the iodine and the metal.

This experiment may be varied in different ways: two pieces of iodine of about the same size, placed at small distance from each other on a silver plate, form separate colored circles, until these come in contact at the circumferences, when the two systems will slowly coalesce and pro-

duce one common outline of the form of an ellipsis.

As the colors formed on various metals by the above-mentioned agents are very similar to one another, it may be sufficient to examine in particular those produced on silver by iodine.

The external film of the iodide of silver rings, which corresponds to the central black spot in those of Newton, is completely invisible, it being impossible to perceive any difference between the parts so covered and those where the metal is intact; but by exposing half the plate to the influence of light, whilst the other parts remain covered, the silver is then found darkened far beyond the limits of the external gold-colored zone, where previously the surface was perfectly clear. The dark film thus rendered apparent is now liable to be rubbed off by the slightest friction, whereas before, it was very adherent to the subjacent surface. The first zone is of a pale gold color, which assumes a deeper tint as the thickness of the film increases: the second zone is blue, the third white: after these appear the different colors of the spectrum in regular succession, as in the films studied by Newton and others, viz. orange, red, blue, green, yellow, &c.

The presence of the golden-colored zone in the place mentioned is worthy of remark, as in the tables of Newton of the colors presented by films of various thicknesses the blue is stated as immediately following the black. The same gold film is the first which appears on most metals when their surface is attacked in this manner. Chlorine and bromine on silver; oxygen on steel; chlorine and bromine on titanium, bismuth, &c., commence their colors in the same way. Copper, however, is in one respect an exception, this metal first becoming of a dark red, which increases to a ruddy brown and then changes into blue.

This deviation is fully accounted for by the color of the copper itself. With this single particularity, this metal undergoes the same alterations as the others.

The action of light on the different colors of the iodide of silver is very interesting: the most correct way of studying this is to protect one half of a system of colored rings by an opaque screen, while the other half is exposed for a short time

to the influence of the solar rays. The golden zone undergoes the greatest change; at first it grows darker, then red, and at length is converted into a beautiful green. The blue film, which comes next in thickness, suffers considerable alteration in its tint, assuming a much deeper and more brilliant shade; the rest of the colors appear to be similarly effected by the action of light, though to a very slight degree, acquiring a trifling accession in their brilliancy. It has already been remarked that light destroys the adherence of the external invisible film; the same thing obtains with the second or gold-colored film, which turns green, *but only to a certain depth* of the film, as may be proved by slightly rubbing the part thus altered; the green color is then seen to disappear, and beneath the pulverulent portion thus removed is found the gold color, having almost the same appearance as before the plate had been exposed. As this experiment may be repeated several times with the same results, it shows to how conceivably small a depth the light has acted to produce this effect.

To ascertain what would take place on augmenting the thickness of the portion turned green, and the adherence of which was destroyed, a piece of iodine was placed on the plate so that its vapor, by expanding, might arrive upon the green, at the same time, the whole being kept from the light; the result was that the additional film combined with the one already existing, producing a blue, being the color which would have resulted by the combination of the unaltered yellow films. I have found no chemical substance possessing the power of arresting, or in any way influencing these changes of color; strong acids, provided they do not attack the silver—for then, of course, the experiment would be destroyed,—and alkalies in concentrated solution, allow the action of light to go on as usual. The hyposulphite of soda, and ammonia in solution have no longer the power of dissolving the green film as they had before the action of light.

When the plate is left still longer exposed, after the changes above stated have taken place, the colors become more faint, and within the zone of green a white cloudy film is caused by the light, which, as it increases, veils the spectral colors beneath.

The knowledge we at present possess in chemistry of the affinities with which different bodies are endowed for combining with each other is but very imperfect, and the causes which complicate most chemical phenomena are so numerous, that it is scarcely possible to compare any two chemical actions to each other. Most of the facts upon which chemical science is founded, are acquired either by bringing the two bodies destined to act on each other into contact by dissolving them in a liquid, or by subjecting them to a temperature more or less elevated.

In the first of these methods, we are so far from being able to calculate the force of the chemical powers called into play, that Barthollet was induced to deny the existence of chemical power in the various phenomena of solution and precipitation of saline substances, and according to him what is called insolubility in a body is merely the result of its strength of cohesion, an entirely physical property.

When the intervention of caloric is required, the effects are still more complicated, as they vary according to the intensity of the heat employed, and the time its action is exerted; besides the chemical action, when it does take place, is frequently so instantaneous that it is impossible in our present state of science to imagine any means by which it might be measured. In the combination of the three bodies, iodine, bromine and chlorine, with the metals, however, most of these objections cease to exist, or may be easily avoided. As their vapors combine with the metallic surfaces at the ordinary temperature, they are all of them in the same circumstances in that respect; and if the temperature should be required more elevated, the gasiform state of these substances, iodine not excepted, enables us to submit the metals to be experimented upon all at the same time to the same influence. If, therefore, it were possible to reduce the metallic substances into fine powders the particles of which were of the same dimensions, by acting upon them with either of these vapors, an idea might be formed of the affinities which produce their binary compounds by the increased weight acquired by the powders in this process; but the difference which exists in the physical properties of the various metals would pre-

clude the possibility of any near approach to accuracy in this mode of proceeding; but by acting on the polished metallic surfaces, as in the preceding experiments, all the advantages offered by the process with the powders are included, whilst several of the difficulties are removed.

As the film of the compound augments, it undergoes the various changes of color which take place in all transparent films, thus affording a means of ascertaining the absolute thickness obtained in different circumstances, when it would be difficult to detect the slightest difference in weight by means of the most delicate balance. The depth of this coating may be ascertained when either the index of refraction of the compound itself is known, or if the angle of polarized light is given by means of the law discovered by Sir David Brewster, between the tangent of the angle of polarization, and the index of refraction. The most convenient way which occurred to me of performing these experiments, was the employment of a bell-glass within which some iodine is fixed at the top; this apparatus being placed over the metal to be acted on, the experiment may be watched in all its progress, and the action can be retarded or accelerated at pleasure by varying the interval of the iodine from the metal, or by interposing at some distance from its surface a disc of paper so as to cause the vapors of iodine to pass through it. Bromine may be made use of likewise by pouring a few drops of it over some carded cotton, and using it in a similar manner with the iodine. In respect to chlorine, it is most convenient to disengage it slowly by dropping a little sulphuric acid upon some chlorinated lime.

In illustration of the objects of this mode of experimenting, I will adduce some of the results it has given me with various metals. Some of the experiments below were performed before I had the idea of watching the progress of combination through a transparent medium; they are therefore less exact than they might otherwise have been: but I have preferred stating them as I had inserted them in my note-book before I had conceived any idea as to their probable utility in the elucidation of chemical affinity and when I intended them for other purposes, which I shall hereafter explain.

Iodine with Silver and Copper.

1st change.	Silver—pale gold.
"	Copper—assumes a darker red.
"	Silver—blue.
2nd do.	Copper—blue.
"	Silver—white.
3rd do.	Copper—white.
"	Silver—yellow.
4th do.	Copper—yellow more extended than on the silver.
"	Silver—Orange.
5th do.	Copper—Red.
"	Silver—blue, bluish-red.
"	Copper—red, with a tinge of green on some parts.
"	Silver—greenish blue.
"	Copper—red, tinged with green.
"	Silver—green.
"	Copper—orange.
"	Silver—yellowish green.
"	Copper—orange tending to red.
"	Silver—yellowish green.
"	Copper—orange-red.
"	Silver—red.
"	Copper—dull green.
"	Silver—red.
"	Copper—green.
"	Silver—deep green.
"	Copper—dull red.

Bromine with Silver and Copper.

5th change.	Copper—sensibly darkened.
"	Silver—unchanged.
"	Copper—deep red.
"	Silver—unchanged.
"	Copper—red, blue.
"	Silver—pale gold.
"	Copper—white, orange of the 2d order.
"	Silver—yellow.
"	Copper—green of the 1st order, red 3d order.
"	Silver—blue.

Chlorine with Silver and Copper.

The affinity of chlorine with silver is much inferior to that which it possesses for copper.

Iodine with Titanium.

Iodine at the common temperature has no action upon this metal.

Bromine with Titanium.

Bromine, when the surface of this substance is perfectly dry, has no more action

upon it than iodine; but if it have a slight coating of moisture, as is formed by merely condensing on it the vapor of the breath, the colored films are formed without difficulty by the vapors of bromine. Their appearance is the same as those of the iodide of silver, viz. gold, deep gold, blue, white, yellow, orange, red, &c.

Chlorine with Titanium and Copper.

Titanium has a stronger affinity than it has for either of the preceding vapors. The combination takes place when the metallic surface is either dry or moist.

Copper—much reddened.
Titanium—not affected.
Copper—passed through several of the spectral orders of red and green until it arrived at almost its last change of colors.

Titanium under the same action received a dull film, which viewed obliquely showed red, green, yellow.

Silver, exposed to the same influence as the two former, had yellow in the centre and blue more externally.

Iodine with Bismuth and Silver.

Silver—pale gold.
Bismuth—some parts yellow, others not attacked.
Silver—blue, white, yellow, orange.
Bismuth—blue, yellow, orange.

In the action of iodine on bismuth, the influence of the physical condition of metallic surface is very manifest. The crystalline texture of this metal may be perceived, and the difference of its hardness admits, to a certain point, of being measured by the difference of the color of the films that are formed on various points; while most parts are yellow, there exist others of an angular outline which remain still unattacked; the same difference is remarked in the other stages of the combination.

Iodine with Mercury.

It is impossible to estimate the affinity between mercury and iodine by means of the colored films, because, on combining, these two substances merely cause a dirty white appearance on the surface of the latter. Their combining affinity appears to be considerable, for when exposed together with silver the action produced with both was red at the edges, little altered in color; on the rest of its surface a dull white film, in the midst of which were seen several dark spots, where the metal was apparently unaltered.

Bromine with Mercury and Copper.

1st. Mercury—gold color.
" Copper—slightly darkened.
2nd. Mercury—blue.
" Copper—dark red.
3rd. Mercury—green on some parts.
" Copper—white.

After this the copper underwent its usual changes of color on prolonging the action of the vapor of bromine, but the color of the mercury suffered no further change.

Chlorine with Mercury and Copper.

Mercury—a slight film.
Copper—no alteration of color.
Mercury—deep gold color.
Copper—deep red on some parts, blue on others.
Mercury—red tinged with blue.
Copper—blue, white.
Mercury—blue.
Copper—same as before.

With respect to the bromide and chloride of mercury, it is necessary to view them obliquely in order to perceive all the changes of color they undergo; for if looked at perpendicularly, there is seen on both a dull uneven film of white which reflects none of the above colors: consequently, to avoid any error, the copper must be inspected under the same angle.

Bromine with Bismuth and Silver.

Silver—pale gold.
Bismuth—not apparently changed.
Silver—deep gold, blue.
Bismuth—yellow, blue.
Silver—blue, yellow.
Bismuth—dull colorless film.

Chlorine with Bismuth and Silver.

Bismuth is slowly attacked with chlorine gas, much in the same way as with iodine and bromine in vapor.

Bromine with Lead.

At the common temperature neither bromine nor chlorine forms colored films upon this metal, which it is very difficult besides to bring to any high state of polish on account of its softness. But when lead is heated, as over the flame of a spirit-lamp, the vapors of bromine then form very fine colored films, which are in succession gold, deep blue, &c.

Iodine with Iron.

These two may be made to form colored films when combined rapidly together, but generally a dull coating without any spectral color is obtained, on account of the deliquescence of that salt.

Until we know the index of refraction of the different films enumerated, it would be impossible to give a correct table of the combining powers in the experiments that have been detailed; nor is the table of the relative thickness of transparent plates as it has been transmitted to us by Newton, sufficient in the present instance, if any great degree of precision be required. Besides these objections, it is necessary before leaving this subject to pass in review several others inseparable from the mode of performing the experiments themselves. The principal circumstances complicating these experiments and liable to vary in different observations, are,—

First, the hardness of the metal acted upon; 2ndly, the obstacle opposed to the continuation of chemical action by the inert film formed upon the metal; 3rdly, the force of the vapors that attack the metal. The influence of the texture of the metallic surface on chemical action is most evident when bismuth is the metal employed. Here the chemical action may be seen to commence on small isolated portions of the surface, which have already assumed a deep gold color, before other parts are in the least changed, from the natural appearance of the metal. To determine how far this might influence the formation of the iodide of silver, a silver coin was exposed to iodine with a piece of pure silver; as the former was so much the harder, of the two, it was naturally supposed that the chemical action would be slower in exerting itself on it than on the latter. This, however, was not the case, as may be seen by the following statement of the result of the experiment:

Silver coin—pale gold color.
Pure silver—pale gold.
Silver coin—deep gold.
Pure silver—deep gold.
Silver coin—light blue.
Pure silver—light blue.
Silver coin—yellow.
Pure silver—blue, white, yellow not visible.
Silver coin—yellow, red at edges.
Pure silver—yellow, no red edges.
Silver coin—red, blue at edges.
Pure silver—yellow, no red apparent.

The intensity of the resistance offered by the different films of iodide of silver to a continuation of the chemical combination may be determined by noting the moment at which the various spectral tints make their appearance.

Color of the film of iodide of silver.

0	50	—beginning to darken.
2	0	—pale gold.
4	40	—deep gold.
6	40	—orange blue.
7	30	—blue.
9	30	—light blue.
11	30	—commencement of yellow.
18	30	—orange red.
20	15	—blue.
22	55	—deep blue.
24	40	—green.
28	0	—yellowish green.
30	25	—ruddy brown.
40	10	—green.
46	30	—green.
50	10	—red.
53	15	—green.

By comparing the thickness of the colors with the space of time required for their production, it will be found, however imperfect the table given by Newton may be when applied to this subject, that towards the end of the experiment above given, the chemical combination is retarded by the presence of the inert film, and that to obtain the same thickness of film as at the commencement, about double the time is required.

The third cause of error may be avoided by operating with vapors of about the same force. In those described, the average time employed in passing to the maximum was generally about half an hour; if that were not taken into consideration, different results might be obtained.

In regard to chlorine, there exists another cause of complication—the affinity which it possesses for water; for when disengaged in the ordinary manner, chlorine carries with it a certain quantity of water which may very much alter the results of the experiment.—*Philosophical Magazine.*

CATALYSOTYPE AND AMPHITYPE.

THE two following letters have been sent to the *Athenæum.* As they relate to the process recently published by Mr. Talbot, and as, moreover, they have a great interest in themselves, we think it a duty to copy them.

In 1844, I sent the description of a new photographic process to the *Britanic Association* of York, and afterwards to the Royal Academy of Ireland. This process was published in the "*Transactions*" in 1845. The materials employed were: A weak acid solution of syrup of iodide of iron and nitrate of silver. I observed in my document, that by exceeding the rapidity sufficient for the production of the photogenic effect, the image is rendered negative, and that *a positive image is frequently developed at the back of the paper.* I attributed this result to an excess of nitrate of silver. I named this process the "*Catalysotype*" a name under which it has been designated in several works relating to photography which have been published since that time.

Publicity has been given to a correspondence between Mr. Talbot and myself, in which he reproaches me for giving my process a particular name, saying that it was useless to give every process a new name, and that the meaning should be comprised in the definition of *Calotype.* I certainly acknowledge that he has a perfect right to express himself upon a subject with which he is so well acquainted, but I answered that the process had been presented to the Academy under the title of "*Catalysotype,*" and there we left it.

At the commencement of last December, Mr. Talbot sent the *Athenæum* the report, already communicated to the Academy of Sciences of Paris, of a process for obtaining instantaneous photographic proofs. The essential matters which he employs are a weak acid solution of syrup of iodide of iron and nitrate of silver, and that which characterizes the result is, that the *negative* and *positive* images are formed upon the opposite sides of the plate.

In reality, this is a slight modification of the Catalysotype, the principal difference being that the proofs are obtained more rapidly by the immersion in a solution of sulphate of iron. Mr. Talbot, however, neglects the opportunity of explaining how new names are inconvenient and useless for designating new facts, because, instead of receiving the word Catalysotype, he has invented another and named his process "*Amphitype.*"

Now, although Mr. Talbot has not mentioned my name as having been the first to make use of the iodide of iron as a *photographic* agent, I think I have cause to lament that he has not accepted the name of my process. The *Catalysotype* is sufficiently familiar at the present time, and Mr. Talbot's process does not differ in any essential point. The agents employed are the same and vary only in a slight degree in their proportions, and from recent experiments I have no doubt that my process, such as was published in 1844, does not have the almost instantaneous effect unless the bath of sulphate of iron is resorted to. The circumstance also which directed attention to the name of amphitype is described in my memoir.

Mr. Talbot has just title to the high position which he occupies in the scientific world, and he can therefore leave to others the small satisfaction attendant upon their discoveries, and I am sure no one is more disposed than he to concede this much; but he has not considered that, to publish the modification of a process, giving it a different name is to virtually substitute the name of that which is improved for the name of that which was invented. I ask Mr. Talbot, therefore, in all justice and conformably to what he has published in 1845, not to qualify the method by which he obtains instantaneous pictures by the name of *Amphitype*, but to present it as an improvement upon the "Catalysotype" in order to leave me the credit of the original process.

THOMAS WOODS, M. D.

Reply of M. Talbot.

In the article signed by me, that the Athenæum published on the 16th of October, I have been particular to ascribe to Dr. Wood the merit (which I consider very great) of having first introduced the use of iodide of iron into photography. The substances which compose iodide of iron are already employed by all the photographers; but their combination had not been made use of by any person before Dr. Woods had given the idea. With this exception—that is to say—to employ the iodide of iron—there remains only a resemblance between the proceeding which I have called *Amphitype* and that which Dr. Woods calls *Catalysotype*. My proofs are upon glass—those of Dr. Woods upon paper. Both giving at the same time a positive and a negative image not—as Dr. Woods indicates by his letter—to the two faces opposite the plate, but upon both at the same time and on the same side—one appearing only when the other disappears, according to the direction with which the light falls upon the plate. The pictures mentioned by Dr. Woods, at the same time apparently both positives and negatives are of a very different nature. They are formed upon paper. The positive image is shown upon one side of the paper, and the negative image upon the other. They are both taken by employing iodide of iron, and are frequently developed by the ordinary proceeding of photography upon paper.

In order clearly to explain their nature, I suppose that a person obtains a negative calotype, and that after having fixed it or dissolved it in nitrate of silver, he exposes it in a copying frame, the face turned towards the light. It is evident that a positive reproduction of the image, is gradually formed upon the back of the paper, and it can be fixed entirely by ordinary means. Now this result, which I have fortuitously obtained, may be fortunately produced, but the result which I have supposed easily obtained, is sometimes fortunate, but in this case extremely imperfect. I have never seen positive proofs satisfactorily obtained by this means, and have only considered them scientific curiosities. I think only Dr. Woods can claim the discovery. I have noted this fact for ten or eleven years, but if Dr. Woods has published it first, it is just that he should have the honor of the discovery, although it can have no relation to the discovery to which I have given the name of *Amphitype*. There is not in photography a more opposite opinion than that of the Doctor and myself. For the same reason that Dr. Woods gives, my new method will be able to render to the friends of Daguerre a simple modification of the daguerreotype, for, in effect, if a daguerrean proof is exposed in a certain manner to the luminous rays—they become both negative and positive.

Although the creation of a new name, that of *Amphitype*, I have believed useless and unnecessary, I have ten or a dozen photographic experiments differing from each other, to which I can give no distinctive names, such as cyanotype, chrysotype, &c. We proffer a new name at a great risk. If it is not judged necessary, it is speedily forgotten. My definition of the Amphitype is this; an image upon glass appears alternately positive and negative, according to the direction of the light to which it is exposed. It presents all the features of the specimens I have presented to the Academy of Sciences at the Athenæum, and by the use of collodion.

If Dr. Woods can give a definition sufficiently succint upon his Catalysotype, it rests with the photographers to decide if my method ought to be considered only as a particular kind of photography, or only a simple modification.

I wrote in 1845 to Dr. Woods that I thought that the Catalysotype differed only from my calotype by the use of iodide of iron as an accellerator in the production of the negatives, the final results (that is the positives) being absolutely identical; but I do not pretend to support an opinion contrary to the evidence.

I can only say that this question is now unnecessarily urged, since I repeat there is no resemblance between my new proceeding and that of Dr. Woods as described in 1845 and which had application to photography upon paper.

H. T. Talbot.

As a continuation of this subject we subject the following article from the London Art-Journal for February.

PHOTOGRAPHY.

We have endeavored to keep our readers informed of all improvements in the photographic art as early as possible after they have been announced. Within the last few months there have been several most important discoveries, by which the processes on glass and paper have been very much facilitated, and the prepared surfaces rendered of a higher degree of sensibility.

Among these, certainly one of the most important is the instantaneous process of Mr. Fox Talbot, to which he has given the name of *Amphitype*, or ambiguous image. We cannot but regret that this gentleman should continue to clog the improvement of an art, of which we must in justice allow him to have been the chief originator, by patent restrictions. The honorable distinction of being a discoverer should, we imagine, satisfy the true philosopher, particularly when placed beyond the necessity of becoming a commercial speculation.

Mr. Fox Talbot's patent for improvements in photography was enrolled December 12, 1851. The first improvement described in the specification, consists in preparing albumenized glass plates in the manner detailed in the last number of the Art-Journal. We need only add, that the solution of proto iodide of iron employed, contains 140 grains in the ounce.

Mr. Talbot then describes the following method of taking photographic pictures when in the country, away from any residence, or on a journey.

A glass cell is taken, formed of two equal and parellel pieces of plate glass; the cell is open at the top but closed at the bottom and two sides, and of just sufficient size to take the glass plate and the necessary quantity of liquid. The posterior surface of the glass of the cell is ground or unpolished, and is placed in the hinder part of the camera, so that when directed towards an object, the ground surface of the glass fulfils the part of the ground glass plate ordinarily employed to ascertain the true focus. The upper part of the cell is furnished at one corner with a funnel, whilst a stop-cock, supplied with a pipe and a piece of caoutchouc tube is inserted into the bottom of the cell. Four bottles are also provided, of the same capacity as the cell, when the plate of glass is placed in it. One of these bottles contains the sensitive solution of silver; the second bottle contains the iron solution; whilst the remaining two bottles are filled the one with water, and the other with solution of hyposulphite of soda.

The operator now drops the glass plate previously prepared, according to the directions given, into the empty cell which is fixed to the hinder part of the camera; having pointed the camera to the object, adjusted the focus, and then closed the first lens or object-glass, he lets fall a curtain which completely covers the glass-cell, allowing only the mouth of the funnel to be seen above, and the waste caoutchouc tube b low it. Care must be taken to prevent the access of light into the cell through the funnel; the sensitive silver solution is then poured into the cell through the funnel; and the object-glass being opened, an image of the object is impressed on the glass plate, after which the solution of nitrate may be run off into the bottle by means of the stop-cock and caoutchouc tube: or, instead of allowing the solution of nitrate of silver to remain in the cell, whilst the glass plate is exposed in the camera, the solution may be run off before the object-glass is opened, and the moistened plate then used. The iron solution is next poured into the cell through the funnel, and after the lapse of a minute run off to waste. The water is then passed through the cell to wash the plate; and, lastly, the hyposulphite solution is poured into the cell, whence it is conveyed away by the same means as the other liquids employed. The pictures thus obtained may be finished at leisure, on the evening of the same day, or on the day following.

The patentee mentions another method of conducting these operations—viz. by the employment of larger bottles of the solutions placed on a stand, each furnished with a caoutchouc tube, with stop-cocks at each end; the capacity of the tube between one stop-cock, and the other being equal to that of the cell employed. The stop-cocks employed must be of silver or plated with that metal.

The second part of Mr. Talbot's specification consists in obtaining the photographic picture of objects in rapid motion—as of a wheel revolving rapidly on its axis.

For this purpose, glass plates, rendered sensitive to light by the process previously described, are employed; the light being furnished by the discharge of a powerful electrical battery.

Mr. Archer, to whom we are greatly indebted for the collodion process, has succeeded in greatly simplifying its use. He fits a cell to his camera capable of holding some solution of nitrate of silver—the required quantity being placed in this, the glass plate covered with the collodion is immersed in it, and subjected at once to the influence of the solar radiations. Of course, all the camera adjustments are previously made; and by this means pictures can very rapidly be obtained.

Mr. Archer has also observed that corrosive sublimate has the peculiar property of imparting a remarkable degree of whiteness to the photograph, and of greatly improving all the effects of the collodion picture. The action of the salt was first noticed by Mr. Robert Hunt, and published by that experimentalist in the Philosophical Transactions for 1840. It was, however, upon the sulphuret of silver, combined with the chloride, that Mr. Hunt obtained this remarkable effect.

Mr. Peter Fry, by combining a small quantity of gutta percha, mixed with the collodion, has very greatly increased its sensibility, and given such firmness to the collodion film, that he now obtains *positives* on the glass plates. The sensibility may be judged of, from the fact that positive impressions of great intensity can be obtained in five seconds by the light of an ordinary gaslight: so that we are no longer dependent upon sunshine for the production of this class of pictures.

The following, also bearing on the same subject, we copy from *La Lumiere.*

NEW INSTRUCTIONS ON THE USE OF IRON IN PHOTOGRAPHY UPON GLASS.

PROTONITRATE OF IRON.

The letters of M. Fox Talbot and Dr. Woods, published by the *Athenæum*, have given a particular importance to the protoiodide of iron as a photographic agent, by making us acquainted with its extraordinary sensibility. Permit me, however, to explain the chemical fact, that this property belongs in reality to the *protonitrate of iron.*.

Some months ago I addressed a communication to your Journal in which I called the attention of *savans* to this new and remarkable salt of iron, which I thought must be of great utility, and lead sooner or later to the discovery of a process by which preparations which have for their end the development of the image withdrawn from the camera, might be dispensed with. This communication contained the different results of a series of numerous experiments upon the catalysotype of Dr. Woods, and I observed that his process, in fact, depend upon this combination of iron. The substances employed by Dr. Woods, are the protoiodide of iron and nitrate of silver. Now the chemical result of their combination is the production of a protonitrate of iron and iodide of silver. It would be a manifest error to consider (as an inattentive reader might), the iodide of iron, in this case, as a chemical agent, because it is decomposed the moment when the proof is plunged into the bath of nitrate of silver. I do not intend to give the impression that the two authors in question consider it as such; all that I wish to show is, that the protonitrate of iron is the true photographic agent in the catalysotype of Dr. Woods and the amphitype of M. Talbot.

I have obtained extremely sensitive surfaces by making use of protonitrate of iron combined with nitrate of silver, without any other substance. But I have arrived at still better results by using the iodized paper of M. Talbot.

By this means, I have produced proofs almost instantaneously. If I pretend that the sensibility obtained by the processes in question depend upon this salt the protonitrate of iron, I nevertheless admit, that the best results are due to its combination (*not chemical*) with the iodide of silver. It does not appear to me probable that the wonderful sensibility obtained by M. Talbot proceeds from any chemical action, still unexplained, which would result from the recent production of some new compound. So we may presume that the protonitrate of iron, when it is newly formed, is much more sensitive than after an hour has elapsed. I have often had myself evident proofs of this fact. You perceive that

M. Talbot immediately after having produced, in a great part, the decomposition of his protoiodide of iron by the nitrate of silver bath, exposes his plates in the camera, and, consequently, the light falls on their surface while the compounds are partially, at least, in a transition state.

I truly regret that my business prevents me, at present, from examining more profoundly, the photographic properties of this salt, I am happy to say, however, that the protonitrate of iron has actively engaged the public attention, and that it has already been employed frequently and with success, as aiding to rapidly develop proofs, a purpose for which its properties particularly adapt it. I think, therefore, that the time is not distant when the necessary operation for developing the daguerrean image, after its withdrawal from the camera, will be no longer classed among photographic manipulations. ROBERT ELLIS.

THE AMERICAN ART-UNION.

THIS institution having failed to distribute its pictures according to the requirements of its constitution, at the proper time last year, postponing until some time in January, and still further postponing it until the 30th of March this year, many of its subscribers became greatly discontented, and many of them offered their tickets for sale.

The Herald, everything and anything as its purse and caprice dictates, published several severe and caustic articles in relation to the matter—one of those occasions, so few and far between, when it takes the side of truth and justice—and, in consequence, was sued for libel by the Managers of the American Art-Union. In retaliation, Bennett purchased a ticket from one of the subscribers and sued out a writ of injunction to restrain the institution from disposing of its property either by lot or otherwise, principally on the ground of its illegality as a lottery. We are not desirous for the downfall of this institution, but we do most devoutly wish to see its principles modified, and its management more equitable and American, for it certainly is not now, either well managed or truly American, as it was designed to be, in its acts. It was chartered for the encouragement and elevation of American art, American artists, and American taste, but instead of pursuing this policy, its managers have departed widely from it, and we find that a large majority of its paintings offered for distribution are from the pencils of foreign artists, and that while such men as Doughty, Duggan, Durand, Elliot, Fisher, and other American artists have but one or two pictures each in its gallery, very many Germans have from ten to thirty. In view of such facts should it deserve the support of Americans ?

We do not object to the employment of foreign artists by the Art-Union, but we do most solemnly protest against the wholesale preference which it gives them in its purchases, particularly, too, when it is conceded that the majority of the pictures so purchased are below criticism as works of art, and far inferior to the efforts of our young Americans that have been refused admittance into the Art-Union collection.

Under these circumstances we must express the opinion that with its present constitution and management the American Art-Union cannot exist many months longer, and that in order to preserve its existence and secure to it that influence and utility originally designed for it, both must be changed. We give below the decision of Judge Duer in regard to the injunction, and the court proceedings of the last day, which we clip from the *Tribune* :—

On Saturday morning, in the Special Term of the Superior Court, Judge Duer intimated that he had decided to dissolve the injunction now in force, restraining the

institution from disposing of their property, on the ground that the plaintiff in this cause had no personal interest in such property, and consequently no right of action.

Mr. O'Connor, counsel for the Art-Union, preferred that his Honor, would pass judicially on the chief points in the arguments involving the legality of the institution. A judicial officer had already pronounced the Art-Union an illegal lottery, and the President and members of the Committee of Management were impressed with the belief that it would not be decorous on their part to act in the face of that opinion, until they were relieved from all doubt by a different expression of opinion from some competent judicial authority. They consequently preferred not to seek the dissolution of the temporary injunction, but to defer the distribution until they could have his Honor's decision. This being their conclusion as to their own course of conduct, counsel hoped his Honor would perceive that it was necessary that the order for temporary relief should be made.

Judge Duer said that he doubted very much whether it would be proper for him to give such an opinion, if he were satisfied that the plaintiff had no right to maintain the action. It could not be permitted that a stranger should file a bill for the mere purposes of the defendant. Suppose that this bill was filed by a person who had no interest whatever, real or fancied, in the property, and that he sought the aid of this Court to restrain the defendants from a distribution of their property, on the ground that it was in effect a lottery, though the Art-Union might come into Court and request an opinion to be pronounced on the main question, yet he, Judge Duer, hardly believed that the Court would pronounce such an opinion. If it was satisfied that the plaintiff had no right to maintain the suit, it should dismiss the bill. Therefore the opinion that he might give in this case, if the parties were not properly before the Court, would be extra-judicial. Parties have no right to make a cause for the mere purpose of obtaining an adjudication. There were, however, some questions not argued, and he was unwilling to decide the case on points not considered.

Mr. Sandford—I have not learned what difficulty your Honor has encountered.

Judge Duer—It can be explained in a few words. The principle object of this bill is to restrain the distribution by lot of the pictures and other articles of value now belonging to the institution; and the plaintiff cannot, in this or in any other suit, be entitled to an injunction, except it appears on the face of the complaint that he has some personal right or interest which would be prejudiced by the distribution. You allege that the plaintiff in this case has an interest in the property by having obtained an assignment of an original subscription, and on this supposition that such a right of property exists, he may be prejudiced in some degree by the sale of the pictures. On that ground alone it is perfectly clear that the plaintiff, as such assignee, has no personal interest in these pictures, and no right of property that could be effected by the supposed illegal act which he endeavors to restrain. The injunction must therefore, of course, be dissolved. I should have great difficulty in saying on the case, as originally presented, that the plaintiff has any interest whatever in this property; for, waiving the objection that the distribution is by the terms of the Constitution confined to subscribers, and waiving the objection that the shares are not made transferable by the terms of the Constitution, and that therefore the plaintiff has acquired no right of property by the assignment—waiving these objections, and considering the plaintiff as an original subscriber, it may still be doubted whether an original subscriber has any right of property in the pictures to be distributed. He pays five dollars as an annual subscription, and his interest ceases at the end of the year. He has no right under the Constitution of the Society to any portion of the property, except he may be the fortunate drawer of a prize. But if the lottery do not take place, and if the distribution be not made, the pictures remain the property of the Art-Union. They are the property of the corporation, strictly so speaking, and no individual can have an interest in them, except that given by the terms of the Constitution. As a general rule, the property of a corporation is in the corporation itself, and not in the corporators. Now, by the terms of the charter in this particular case, the property in possession of the Art-Union at its dissolu-

tion belongs to those who are members of he Society at that time ; and those who have ceased to be subscribers have no interest in that which is a permanent property of the corporation. But there is an unanswerable objection, founded on the terms of the statue. Plaintiff seeks to restrain the drawing of the Art-Union on the ground that it is a lottery ; and if it is so, it is a lottery plainly within the provision of the Revised Statutes, and I have no hesitation in saying now that if I were pressed to give a judicial opinion, I would found it entirely on the application of these provisions. If I did not even consider them as embracing the present case, I should have difficulty in saying that the distribution was an illegal lottery, and therefore I am prepared to say that my opinion is founded on the provisions of this statute. If the distribution is not a lottery within the meaning of this statute, then I would hold it not to be a lottery prohibited by law. But if it is a lottery by this statute, it then seems clear that plaintiff has no personal interest in the property, because the 31st section declares that "all property so offered for sale, distribution, or disposition, against the provisions of law, shall be forfeited to the people in this State as well before as after the determination of the chance on which the same was dependant. And it shall be the duty of the District Attorney to demand, sue for, and recover in behalf of this State all property so forfeited, and to maintain the proper actions for the same after demand made, and to pay the proceeds of the sale of such property, and any moneys that may be collected in any such suit, into the County Treasury, for the benefit of the poor." The consequence, therefore, is, that if this property is unlawfully offered for disrribution, on the ground that it is a lottery, the title not only of the corporation, but of each individual corporator, has been divested, and the right to it belongs, at this moment to the people of the State, and the motion of the District Attorney at present is, not to try the question but to enforce the provisions of the statute. If the plaintiff is right in saying that this is a lottery, then he has no interest at all in it, and has no more right to have an injunction placed on it than a total stranger would have.

Mr. Sandford, plaintiff's counsel, replied that he had prepared what he had supposed to be a conclusive answer to these objections ; but as the point was not made on the other side, he had not, of course, been called on to argue the matter before. It was stated that it would be conceded Mr. Bennett had all the right which Mr. Hoe originally had, and therefore he had not referred to this matter in the argument but he would now address to the Court his answers to the two suggestions made, and which he supposed to be conclusive on this question. Plaintiff's answer is, that if this association have no authority to put up and dispose of this property by means of a lottery, or raffle, or by any operation of chance, then the act of putting it up, for the purpose of such distribution, is the individual act of the managers, and not of the corporation, and the members cannot be deprived of their right by reason of the unauthorised act of those who are temporarily entrusted with the management.

Judge Duer—How can this be, when the feature of the distribution is not an unauthorized act, but provided for in the constitution of the society, and is recognized by the Act of 1844 ?

Mr. Sandford—The Art-Union is recognized as a company having a Constitution, but it is also recognized as a company having all power to change their Constitution. The law of 1844 was one merely regulating the time when the distribution should take place, without saying anything as to the mode of this distribution. Of course, if no particular mode was laid down, then the corporation had a right to change the constitution, and in the Act of 1847 this right is expressly declared. This is the first answer. It is perfectly clear and well settled that the unauthorized acts of any agents of a corporation do not bind the corporation. I submit another answer. Suppose a case of the putting up of property by the owner ; if the cause of forfeiture exists, the rights and interest of the owner in the property cannot be divested until there is an adjudication on it, that the cause of forfeiture does exist ; and the District-Attorney cannot maintain any action of trover, or replevin, or trespass, for this property, and can only maintain an action founded on the statute, to have a legal adjudication, that the cause of forfeiture exists. Now, this is a settled point

of law, and I refer your Honor to the case of The New-York Fire Department *v.* Kipp, reported in 10 Wend. 266, where it was decided, that no title was vested in the State until it was first adjudicated that the cause of forfeiture did exist. The rule of law is, that till there is an inquisition to ascertain the existence of a defect, the title cannot be divested. Take the case of the alien who may be entitled to hold property by devise; you cannot escheat the property till an inquisition is held to decide the question whether he is an alien or not.

Judge Duer—That is a settled law.

Mr. Sandford—And in this case the principle is precisely the same. The Art-Union acquired this property for perfectly valid purposes. Their object, they stated, was the promotion of art. On their theory this corporation was endowed with power to purchase property for honest and legal purposes; and this distribution is a mere result of the corporation's action, and a mere mode of disposing of the property which, *ex necessitate*, could not be disposed of any other way. If so, this may subject them to have their property forfeited; but our position is that there must be judicial proceeding taken and judgment ascertained that the cause of forfeiture exists; and the judgment which should produce forfeiture must be pronounced before the title of the members can be affected. If this be so, whatever rights the people of the State of New-York may have to proceed against this property, that does not affect the rights of the parties who are interested in the property to prevent the unlawful distribution being made. It is not certain that the people will prevent the distribution taking place, and that the shareholders, are not to be deprived of their property illegally because the people may have a right to have it condemned and forfeited. The shareholders, therefore, have a right to it until the adjudication takes place.

Judge Duer.—There are some decisions on the subject to which you have not adverted. As the defendant does not desire the dissolution of the injunction, I shall not proceed to give my opinion now; but I confess that my own views as to the construction of the statute and as to my duty, remain unchanged. I think it necessary, however, to explain them more fully, and therefore shall give no decision to-day.

Mr. O'Connor—Our desire is, that from some department of the judiciary we may have a review of the opinion pronounced in the Court of Sessions, and for this reason I have made the observations which I have, in the hope that the Court may see with clearness to examine and decide on the question; and we are ready to bow to the decision that may be pronounced.

— Since the above was in type the following decision has been made by Judge Duer. This may be said to settle the legality of the Art-Union lottery. But it does not settle the matter of mismanagement upon the part of the directors, nor will it give the people greater confidence in its impartiality or stability. The institution to prosper hereafter must change its tactics very materially, particularly in regard to its employment by the week—as we are given to understand has been done—of inferior artists to paint their pictures for distribution. Their course should be more liberal before they can justly claim the liberality of the public.

His Honor after remarking that the defendant supposed all these proceedings to be in conformity to law, proceeded to say:

The plaintiff claims as assignee and seeks to restrain the distribution of the works of art, which were purchased with the funds of the Society, or works which the subscribers had given to it. He seeks to have them sold and distributed among the shareholders, on the ground, that the shareholders are the true owners, and have the right to interpose to prevent their property being distributed in a mode which the laws of the State forbids. It is not necessary to inquire whether the shares are transferable, and I will assume that the plaintiff is clothed with the same rights as the original proprietors. But then he is also subject to all the responsibilities as would be the person from whom he purchased it. And if this suit could not be maintained by that person *a porttonari*, why the plaintiff cannot do so. Have then the subscribers to the Art-Union a right to the paintings &c. bought by the subscribers? It is not true that the individual corporators have such a right of property; it is vested in the corporation. Nor have the corporators any right except what is given to them by the *by-laws*. The rights of the corporators are only such as are given

them by such *by-laws* as are adopted in conformity to the charter, and according to law. The subscribers to a Bible Society have no right to its property. They contribute to it merely to promote the interest of the society, and in like manner the subscribers to the Art-Union who subscribed to it for one year have no right in it but what is ensured to them by its *by-laws.* The charter on *by-laws* says that they shall have a chance in the distribution of the paintings, &c., and nothing else, but it gives them no right or interest in the property itself. It is no more than a contract between the society and the annual subscribers, stipulating to give them certain benefits and chances for the paintings at the close of the year.

If, then, it is not a lottery within the meaning of the constitution or the law, then there is no right or favor to prevent a distribution of the paintings. Between supposing that it is a lottery, which the Court should restrain, *who is it that comes before the Court to obtain such a restraint?* A man who purchased a ticket, and is himself guilty of a violation of the law which he charges upon the defendants. If the contract was lawful he has no right to complain, and if it is *unlawful* he is himself a *participis criminis*, and therefore has no right to complain. If on no other ground, I will dismiss the complaint on the ground that the plaintiff is the purchaser of a ticked in an unlawful lottery, by his *own admission*, it is true, he seeks through the Court to ged rid of an unlawful contract, and can have no claim to redress. But if I am mistaken as to the subscribers having no interest in the property of the corporation, purchased with their funds, and as I said on Saturday, if the distribution of the paintings by lot is a lottery, within the meaning of the Revised Statues, then the plaintiff has no title to the property, as the society have ceased to have any right to it. If the allegation of the plaintiff is true, and that it is a correct exposition of the Law, then the paintings, instead of being vested in the Society are vested in the people of the State, by virtue of a forfeiture by law.

I have carefully abstained from giving my opinion on the main question in this case, not that I have not formed a definite opinion in relation to it, and would not shrink from giving it if it was necessary to do so. But if the plaintiff has no right to agitate the question as a suitor, I, as a Judge, have no right to give any opinion which would be extra judicial, and while question is pending in another court.

The injunction must be dissolved and the motion for a permanent injunction denied. The plaintiff to pay $10 costs.

OBITUARY.

MR. J. M. W. TURNER, R. A.

THE close of the last year, added a name to the list of the great men who have passed from among us during that period of time which ought to, if it does not, excite deep regret beyond the circles with whom that name was closely associated. When a distinguished statesman or a successful commanders itaken away from the living, it is long ere the popular voice is silent over the event; the death of one whose genius is of a less stirring and exciting character is little felt out of its own sphere, and the multitude scarcely knowor care,

> "That from the firmament a star hath fallen."

It is presumed that our readers have already heard of the lamented death of Joseph Mallard William Turner, R. A., a name so intimately connected, during the whole of the present century, with the Fine Arts

of this country; and it is no disparagement to the artists of undoubted talent whom he has left behind, to affirm that we have lost in him the greatest landscape painter of the English school; we should scarcely say too much, if we add, or of any other—ancient or modern.

Mr. Turner was born in Maiden-lane, Covent Garden, it is supposed, in 1775, for he was christened in the parish church at St. Paul's on May the 14th of that year. His father carried on a respectable business as a hair-dresser; and it reflects no little credit on his discernment and wisdom, that he allowed his son to follow the path which nature had marked out for him, as soon as it appeared plain and palpable. It is unnecessary, even could we afford the space, to travel over the ground which the young man took till he had established his own reputation among the artists of his earlier time; but it may be stated, that he was indebted for much sound advice, and the use of many valuable copies, to the late Dr. Munro, an amateur of high taste, and a connoisseur of no mean judgment. The Doctor possessed a large and important collection of water-color drawings, which he liberally allowed some of the young artists of that day to copy; and among those who availed themselves of this privilege, were Turner and his somewhat older companion Girtin. To these two we unquestionably owe the distinguished position acquired by our school of water-color painters; while it may be remarked, that their drawings bear so close a resemblance to each other, that it requires very nice scrutiny to distinguish between them. Turner's however, exhibit more elaborated detail than those of the other, yet no less breadth and richness of effect. Neither of them, indeed, will bear comparison with the productions of other men of later times: the art of water color painting has since been carried to a height of executive power that almost rivals oil; still we have seen drawings by Turner, of forty or fifty years back, of marvellous depth and truth of coloring.

In 1789, he entered as a student at the Royal Academy, sending to the Exhibition in the following year, a "View of the Archbishop's Palace at Lambeth," executed in water-colors; in 1793, he executed his first oil picture. From 1790 to 1800, when he was elected Associate, he contributed to the annual exhibitions of the Academy nearly sixty works. In 1802, he was placed among the Academician, his chief pictures of this year being "The Fall of the Clyde," and "The Tenth Plague of Egypt."

It would be occupying our columns to little good purpose, to fill them with a list of the pictures contributed by this wonderful and indefatigable painter to the Royal Academy and the British Institution during more than half a century; they have become as familiar to the frequenters of those galleries as "household words;" they have been admired or sneered at as the fancy or judgment of the visitor has dictated. Of the engraved publications which have emanated from his pencil, we may allude to the "*Liber Studiorum*," published in 1808, and now a very rare work. It consists, as it name implies, of a large number of studies or sketches made in a remarkably free and powerful manner, in imitation of Claude's "*Liber Veritatis*." His "Rivers of England," from an exceedingly beautiful collection of drawings in the possession of the artist at the time of his death; his "Rivers of France," "England and Wales," from a series of noble drawings belonging to Mr. Windus, of Tottenham, and Mr. Munro; "The Southern Coast;" his Illustrations of the Poems of Scott, and Byron, and Rogers; are each and all of them works that will confer immortality on the name of the artist, irrespective of the larger and single engravings from his pictures.

It is our firm conviction that the present generation must not sit in judgment upon the genius of Turner. We are too close to his pictures to see them in their right aspect, and the mind has become too unevenly balanced by the opposite opinion of his detractors and his admirers, to pronounce a clear and unbiassed verdict. Sir Joshua Reynolds had also, in his lifetime, to undergo the same ordeal of praise and calumny; but posterity has rendered him strict justice, by giving him a place among the greatest masters of Art. We have no doubt of similar honors being awarded to Turner, for we believe him to be the most extraordinary painter, (and by this we mean his genius) that ever took pencil in hand to delineate the marvellous beauties

of the world around us. It must not be lost sight of by those who would estimate the value of an artist's works, that there are two standards by which they should be judged—their truth and their poetry; or, in other words, by the appeal they make to our natural senses, or to our imagination by their ideal beauty. There are some of Turner's works possessing each of these qualities; some that have both: and some, it will be said, though we do not think so, that have neither. It is long before one can sufficiently understand a style of painting altogether new and original, to estimate its merits. Great geniuses have ever been great experimentalists, and Turner's vast and comprehensive mind disdained to follow in the track marked out by others, however distinguished; hence, he broke away from the trammels which the dogmas of schools would have interposed between him and his genius, and hewed out a way for himself through the world of nature, which none had ever passed before, and which few can hope to follow.

He saw things as no one else saw them who had not the same power of perception and analyzation; where most eyes would perceive in a few acres of meadow land an unvaried mass of green, his would see it broken and diversified by a thousand tints and tones of color; his would detect in the clouds of a summer's sunset a multitude of beautiful and harmonious tints, where the ordinary observer would scarcely find half-a-dozen; and it was by his combination of colors, and by the arrangement of picturesque yet natural objects, that he achieved such wonderful forms of beauty and such magic effects; and however eccentric some of these might appear, so as to bring upon the painter even the charge of artistic insanity, there is "method in his madness," and beauty in his seeming extravagances. There never was an artist who so played with the elements—not in very wantonness, but with purposes of truth and with actual sensibility, as Turner; his faculties of observation and perception were vast and his memory must have been wonderfully retentive, for it would have been impossible for the most rapid sketcher while seated at his sketch-book, to have caught, as he did, the variety of tints and forms exhibited in the passing clouds. The luxuriance of his pencil is its highest charm, elevated by a "subtle power of expression," as Mr. Ruskin observes, "even of the characters of mere material things, such as no other painter ever possessed." His summer evening scenes are not those of Claude, nor have his tempests the savage grandeur of Gaspar Pouissin's. Of Turner's, respectively, it may be said—

"'Tis *strange* by fits, by starts 'tis wild;"

but neither are irreconcileable with the varied operations of nature. "all," to quote our former authority, "have this noble virtue—they are, in everything, his own; every faculty of his soul is fixed upon nature only, as he saw her, or as he remembered her."

The points he most aimed at in his works are light and space; their highly luminous qualities are their grand characteristics: we scarcely have ever seen an important object in his foregrounds, but generally in the centre of his pictures; where, also, is to be found the greatest mass of light, and opposed to the point of sight is the darkest and largest quantity of shade. We see these principles exemplified in the picture of "The Golden Bough," in the Vernon collection; while the effect of space and air in the same work, produced by the most elaborate and delicate application of touch and tint, carries the eye over miles of distance, where we can discern the exact character of the landscape before us, till it is lost in the harmonious blending of earth and sky, into which fancy only can penetrate.

To be Continued.

GOSSIP.

It should be borne in mind by the Daguerreans of New York, that on the first Tuesday in May next the State Daguerrean Association has its third semi-annual meeting at Rochester. This will be an exceedingly interesting reunion. Besides the various reports by the committees appointed at the last meeting which will be read, each member will exhibit a specimen of his skill in the art, and various suggestions and resolutions will be presented for the consideration of the society.

It is the duty of every Daguerrean to sustain and foster this association, and none but those who are devoid of talent and respectability will hesitate for a moment as to the course they should take towards promoting its welfare. Arguments in favor of scientific and other societies have been so often presented to the public that it seems almost useless to say more, for it is natural to suppose that if a man is not now convinced of their utility he never can be.

There are many, however, who, although convinced, are careless, lukewarm and indifferent, and these we wish to influence to put their shoulders to the wheel and raise it out of the rut of apathy into which it has so deeply sank.

Of what benefit can such an association be to us? ask some, and we answer; if there was no other benefit, the additional respectability and dignity which it would impart to each of its members would be sufficient to induce every Daguerrean of the least self-respect to sustain it by their influence and talents. But this is not all. Associations, properly conducted, always beget a spirit of good will, harmony, and esteem among their members, to a greater or less extent, and with these sentiments, greater liberality must prevail, and just in proportion as it does so must the art become elevated in its position.

We have found during our intercourse with Daguerreans that the most ignorant were the most self-satisfied with their acquirements, and we have frequently had causes for merriment over specimens that have been exhibited as the acme of skillful manipulation. We suppose that these pictures were shown to us for the purpose of receiving favorable notice in our Journal, and we should have gratified the aspirants had they been worthy of notice, although they were not subscribers to the Journal, for we have made no distinction in this matter, but noticed freely such as have been submitted to us. Such men we feel assured can never be benefitted by daguerrean associations, or any other kind of society, and we can only look upon them in the same light as we would on a carbuncle upon a beautiful woman's nose, applying the same kind of alopathic treatment for their eradication.

But there are men in the business from whom we have a right to expect better things. Men whose minds indicate more than mere mechanical skill and whose work give evidence of much taste but which certainly shows room for improvement. In fact there is not a Daguerrean in the United States who is perfect in the art, and for any of them to assert that Photographic Societies, and publications are "*humbugs*" is not only absurd but evinces a degree of mental acquirement perfectly incompatible with fitness for the beautiful

art. Such men often imagine that their success depends upon the elegant style in which they fit up their rooms, or the number of galleries they possess, but we must express the opinion that the manner in which they present their views upon scientific research and scientific associations, on all favorable occasions, does more to disgust a liberal minded and enlightened public, than all their fine galleries will make proselytes.

In speaking thus of the opponents of Daguerrean associations and publications we take a critic's privilege, and assume an editor's right, for to be "critical is to be severe" at times, as it is impossible to be just and praised always.

Would not a man be looked upon as the most arrant numskull in the world were he to assert that the Academy of Science of Paris, the Royal Society of London, or any of the American Societies of art and science were "humbugs" and worthless to the community? What has tended more to the dissemination of useful knowledge among the people than these societies and their publications? What has tended to elevate the mind of man more, even among the lowest mechanics? What has filled our workshops with powerful and beautiful machinery, our rivers with steam boats, our seas with exquisitely modeled and swift flying vessels? What but a free interchange of scientific knowledge between man and man.

Suppose for a moment that the great discoverers of the photographic art—M. M. Daguerre and Niepce, had acted upon the same principles that the narrow-minded men of whom we speak advocate, and kept within their own bosoms the secret of their own invention, using it for their own agrandisement, and suffering it to die with them; where would these very sticklers for non-intercourse be at this day? Why some of them on the cobblers bench, in the fish market, the stable, or behind a bar retailing bad liquor at three cents a glass.

We have reason to believe that the meeting of the NEW YORK STATE DAGUERREAN ASSOCIATION this spring, at Rochester, will be the largest and most spirited yet held, as well as most interesting. We trust all its members will be present, and that every Daguerreotypist who values his own welfare will make it his special duty to attend also and enroll himself among its members.

Many very great discoveries have lately been made, and are now making in Europe in the photographic art and we predict that it will not be long before many of our short-sighted operators will regret not having paid more attention to improvements, and having wrapt themselves up in the imaginative mantle of perfection, the reality of which they never can possess.

At no period since the invention of the photographic art has there been so many valuable discoveries and improvements as within the last six months, and, as in the first instance, to France and England are we indebted for them.

None dispute the superiority of American daguerreotypes over those of all other countries, but all are astonished that among so many excellent practical daguerreotypists as we possess in this country, none have made themselves a name as the discoverers of some improvement worthy of more than a passing notice.

There is not an improvement now in use among our artists at the present day, that enables them thus to excel, that did not first eminate from some European daguerrean, and that European a scientific man. The process of gilding, the use of chloride of iodine, bromine, and even the dry quick were first applied to the art either in France or England.

The various methods of making the latter pursued by our daguerreans cannot

be called inventions; they are mere modifications of the invention and are actually better only so far as they enable the lime to hold more permanently the bromine which it absorbs, for the same difficulties occur in their use which were prevalent before their adoption.

And why is it that Americans do not add to their reputation as inventors as well as manipulators in the art? The answer is given in the remarks made to us a very short time since by one of our most successful artists.

"Daguerreans in this country are not a scientific set of men; they are merely imitators not researches."

This is unfortunately too true. So many take it up only to use and abuse it that our really scientific men are actually ashamed to attempt experiments in it, or have it known that they are in any way engaged in it, for fear of being considered daguerreotypists.

There are, notwithstanding, many more engaged in the art who are its ornaments, and who command the respect of all classes; but these too are deterred from making researches into its secret principles, or when they do and are successful, are deterred from making their discoveries public—to use the language of one of them—"because there are so many knaves who are constantly practising upon the credulity of the more simple that an announcement of a discovery by any connected with the art in this country is synonymous with "*humbug*" and that it is as much as a daguerreans reputation is worth to father an invention." In short it appears to be considered, now, by the daguerrean community, that discoveries and rascality go together.

Now, what is the remedy for this state of affairs? We answer, well organized Photographic Associations, both National and State. From these associations can emanate all inventions and discoveries impressed with the seal of truth, and the designing men who suck so assiduously at the bung-hole of credulity—to use a homely expression—will be deprived of their occupation, while the talented and simple minded but honest artists will be protected in their inventions, and secured against imposition.

We, therefore, beseech our artists to foster and sustain the NEW YORK STATE DAGUERREAN ASSOCIATION, as the only means through which to elevate the character of, and beget respect for, the art.

We also wish to witness the formation of a National Society, and we regret that those who have the subject in charge are so dilatory in their movements. The time has gone by for any favorable action this spring, but we do hope that a suitable time and place may be fixed for a convention next fall. We know the majority of our subscribers are favorable to the measure and we would urge them to take decided action in regard to it, and correspond with the committee freely. This committee consists of Messrs. Henry Mead, A. Morand and M. M. Lawrence of New York city.

— The Daguerre monument proposed to be erected in the city of New York progresses slowly and its accomplishment will never be realized unless more energetic measures be adopted. Mr. Davie of the committee is the only one we believe who has done anything towards it, he having obtained two hundred and fifty dollars.

We therefore propose that all those Daguerreans who feel disposed to contribute funds for its erection forward to Mr. Davie, Mr. Haas, Mr. E. Anthony or to the Messrs. Scovill in New York, whatever amounts they wish to subscribe immediately, to be placed by them in one of the City banks until the whole sum, ten thousand dollars, is realized, with the proviso, that if

the amount is not subscribed within one year from the first of May, 1852, the several amounts so subscribed shall be returned to the donor.

— We took occasion in our last to notice an article from the N. Y. Tribune announcing an important discovery of a substitute for glass, and to express the opinion that it was nothing more than an old invention revived. We were led to these remarks from private information received in this city, and we disclaim any allusion to the subject of the following letter, for we were not aware that Mr. Carvalho was meant by the article. We had reference to another case entirely. We give Mr. Carvalho's letter entire in justice to him. We would state, however, that Mr. Anthony now has for sale a similar article, and before we express any opinion in regard to the merits of either we should like to see Mr. Carvalho's tested.

Heretofore, various substances have been used to effect the same object but without avail. The article offered by Mr. Anthony is the best we have ever seen or heard of, but from the impartial tests it has had since he received it from France,—where it was invented—he is not fully prepared to recommend it strongly for the purpose intended. We are of opinion, however, that it is a good article for preserving the picture; it certainly gives it a softer and more pleasing tone although it injures somewhat its distinctness. But this may be owing to the want of skill in a first application.

H. H. Snelling, Esq.—Dear Sir,—In your Photographic Art-Journal for this month, I observed that you have copied an item from the Tribune, relating to a discovery by a gentleman of Charleston, of a process for enamelling Daguerreotypes. You have also appended an editorial notice thereto on which I shall take the liberty to say a few words.

It is not my province to dictate to the Editor of a Scientific Journal the course he should preserve when claims for discoveries or improvements are made in or connected with the art, which is the subject of his labors, by persons far removed from the city from which the publication, emanates, but it is the privilege of all, and particularly my duty as the individual evidently pointed at in the article referred to, to comment on the editorials,—even this I will forgo as I am under the impression that if you had been rightly informed on the subject, you would not have written anything so emanently calculated to injure me. I therefore shall only give you a few items for your future government, with respect to my discovery.

Imprimis. *I never purchased it,* nor had I the first idea from any person on the subject.

I have arrived at the present perfection of a highly transparent enamelled surface to daguerreotypes, precluding the necessity of glass covering, by a long continued series of experiments. If the discovery is not new it only exemplifies the old adage or proverb, "there is nothing new under the sun." *I have never revealed to any one how my enamelled surface is produced;* I have never made experiments for it in the presence of a second person, and my laboratory is under lock and key. I have only allowed *three* pictures to go out, one in the possession of the editor of a paper here who gave me his word not to let it go from him except to be seen in his presence, the other two my brother has taken to Europe, previously, however, he exhibited them at my request to several gentlemen in Philadelphia.

I have personally shown them to several operators in Charleston, who think it a valuable discovery, and they have never seen or heard of it before.

If it is an old process revived, your informer must be in possession of my process—where and how did he obtain it?—from whom did I purchase it? and how much did I give?—I should like to know his name.

I have been before the public as an artist for *over eighteen years*, and have borne with becoming modesty and fortitude the flattering as well as *candid* expression of criticism which my paintings may have deserved, and for this discovery I am willing

to undergo the same ordeal, but I would rather wait for such severe remarks until my pictures by the process *is before* the public.

I have not written this officially, but you can make use of it or any part of it if you think proper. Your Journal was handed me for perusal, I never have seen it before, and the scientific character of several leading articles has induced me to request you to consider me as one of your subscribers.—I am respectfully,

S. N. Carvalho.

Charleston, March 23, 1852.

— Our friend, Zealy, of Columbia, S. C., is peculiarly favored of the Muses. The following poem sent to us is the second we have had to record to his praise

TO MR. ZEALY, THE DISTINGUISHED ARTIST, IN RETURN FOR THE PRESENT OF MY HUSBAND'S DAGUERREOTYPE.]

My husband's picture to the life,
O, bless the art to which I owe it!
Her thanks would, now, a grateful wife
Return to him, who did bestow it.

Who, without fee, without reward,
Conferr'd on her, so great a treasure,
One, that her heart and eyes regard
Above all price, beyond all measure.

A happiness to her for life,
Her husband, evermore, beside her,
Death, absence, howsoever rife,
Now, cannot, from him, all divide her.

" The art that can immortalize,"
Hath, to her latest gaze, ensur'd him;
Hath given, ever, to her eyes,
All, all that to her soul endeared him.

The experience of that guileless heart,
The beamings forth of that pure spirit,
These, evermore, this noble art,
Hath given, for her, to inherit.

Not hers, by what dim time confess,
Not hers, alone, by dream or vision,
But hers, aye, *demonstrably* hers,
While sight and light perform their mission.

M. M.

Columbia, August 18th, 1851.

— The photographic art has had to pass through a fiery ordeal since our last, no less than four galleries having been wholly or partially destroyed by the devouring element.

The first was that of Mr. D. E. Gavit, 247 Broadway, which occurred early in March, destroying his whole stock. The daguerrean art and the whole country suffered an irreparable loss by this occurrence, as Mr. Gavit's gallery contained the largest, best and most valuable collection of daguerreotypes in the world. Splendid portraits of some of our most remarkable men, and which can never be replaced, were consumed. Mr. Gavit's loss was total, as his policy of insurance expired only a day or two previous.

Mr. Gurney was the next to suffer—but we are happy to say received very little damage—and following close upon his disaster was that of Mr. Whitehurst, whose beautiful gallery in New York was nearly ruined by fire and water on Sunday morning March 28th.

The fourth and last case was that of Mr. Clark of Ithica N. Y., who while in this city purchasing his spring stock received a telegraphic dispatch on the 29th ult. that his gallery had been burnt out. The amount of this young but deserving artist's loss we have not learned.

— Our friend G. S. Cook has also been treated to a catastrophe, or rather a horse-accident, as will be perceived by the following article which we clip from a Charleston paper.

On Saturday last a horse (a fine spirited animal) became restive, broke from his owner, and rushed at full speed up Hasel street. The fair promenaders of King street, who witnessed his approach, flew hither and thither to escape the expected danger, but on approaching the corner instead of turning and keeping the middle of the street, as every well behaved nag should on such occasions, he continued straight forward and with an enthusiastic furor and a taste for the fine arts exhibited in *his* peculiar style, dashed madly into Cook's

daguerreotype establishment, overturning and smashing his elegant show-case, and distributing upon the pavement the many exquisite miniatures it contained, much to the detriment of the same. The horse escaped without injury, and although we cannot say as much for many of the pictures, we are yet pleased to know that the beautiful counterpart of Miss Julia Dean, as also the equally exquisite likeness of the pretty lady in the bloomer, still remain uninjured to adorn the studio of the artist.

— ALLEN'S IMPROVED CAMERA-BOX. We give this month our second plate of Improved Daguerrean Apparatus. This box is most beautifully finished and presents several advantages over those heretofore sold. The focus is drawn upon the spectrum by means of the crank *A*—shown in the engraving—on the outside of the box, and when the focus is obtained the extension box is fixed by means of the thumb-screw *B*, attached to the crank, also on the outside. The advantage of this arrangement will be seen at once, as the operator is enabled to keep his eye steadily upon the image drawn on the spectrum and fix the focus at the exact point and prevent the variation of a single hair's breadth. Another decided improvment in this box is, that there is no necessity for removing the spectrum, as the dark slide can be shoved into its place by simply throwing back the spectrum half an inch, the grooves for the reception of the plate-holder and spectrum being constructed for that purpose. The relative position of the spectrum *D*, and plate-holder *C* when in the box, is seen in the engraving.

— We are certainly obliged to the *Scientific American* for its gratuitous and favorable notice of our March number, and shall always be pleased to receive the commendations of that valuable sheet, but we think its editor should regularly exchange with us. We sent the first three numbers of the Photographic Art-Journal with a request to exchange, which was promised, but never fulfilled, and we came to the conclusion that Mr. Munn did not want our paper and sent no more. We shall be happy to reciprocate favors with a brother editor, but we cannot send our Journal a-begging. It does not require editorial alms.

— We record the following just praise, from the *Tribune*, of one of America's brightest geniuses :—

BRACKETT'S GROUP OF THE SHIPWRECKED MOTHER AND CHILD.—The following letter from Horatio Greenough, one of the most competent critics as well as distinguished sculptors in America, determines the character and claims of the group of statuary which will be opened to the public to-morrow at the Stuyvesant Institute :

"BOSTON, Monday Feb. 23, 1852.

"MY DEAR SIR :—I have several times sat for an hour in the same room where Mr. Brackett's group of the 'Wrecked Mother and Child' is exhibited, and always with a new sense of the power which has made that block of stone the vehicle of so many sad and tender thoughts, expressed in the language of beauty.

I have admired the art by which he so placed the head, that a glance tells us her sufferings are passed, and so swept every limb and tress, that we see the surge has lodged her there, and there left her.

To have told all this at the first glance even to the indifferent eye is a triumph. The action of her left arm, or rather its *record* of her last act, is most happy—the babe has been hugged to her heart, and borne out of harm's way to the last moment of consciousness, and there is visible in the posture of her limbs the decency and dignity of womanhood.

I was a little puzzled at the eagerness of many spectators to get so near this work that it was impossible for them to see it, and I venture to suggest to those who wish to enjoy it, that they sit quietly

on the several sides of the room, and even there survey it with half-closed eyes. The work is of marble—it is in vain that you will seek aught else by crowding upon it. By remaining at a proper distance, you will find that it is no longer marble, but poetry. To hope to enjoy higher illusion by scrutiny, is like going to Milton to enjoy the *blue* of the Blue Hills.

I was somewhat pained by the reflection that this work—wrought with all the fervor and self-sacrifice of an earnest mind—was almost overlooked in the hurry of busy life, amid the crowd of competitors for the spare time of the public ; but I took comfort from the remembrance that works of this class must be before the world for a season, before they are fully seen and valued. I felt sure that others, too, must feel toward the author of it as I felt, and that something might be effected to secure it a permanent place in one of our public buildings.

As the work of one who has studied here *at home*, I must think this group worthy of an enduring position somewhere. I cannot but feel also that the artist has a claim on his fellow citizens for the means to go on in the path he has chosen, and for which he seems so well fitted.

If any one will read the gratulatory and exulting notices with which the press and the leading men of the country have from time to time cheered the efforts of American artists, he must feel that such stimuli are as the sound of a trumpet to a youth conscious of artistic power, and I think that when at the public call he starts thus *full grown* to the race, he should have fair play.

I can only say that if a subscription is organized to purchase this work for some public institution, I shall be happy to contribute my mite for the object.

I am, dear Sir, your obedient servant,

Horatio Greenough.

Richard M. Dana, Esq.

— The Tribune inserts a day or two after : " We were admitted last evening to a private view of this group, which opens to the public this morning at the Stuyvesant Institute. The high praise of Greenough was only just, for it is one of the finest sculptures ever wrought by an American. The success of the work lies in its simplicity. It tells its story completely and without effort. The waves have lifted their victim upon the rock and there left it. The mother, a naked figure, lies toward the spectator, upon her right side, the limbs lithe with the first flexibility of death. The right arm is thrown forward a little beyond the head, as it lies, and the left falling toward the back, still clasps the child. The hair, a drenched mass flows off upon the rock, and over the whole broods that air of pathetic repose which is the feeling belonging to the subject and to the moment, and whose triumph it was easy to mark, last evening, in the hushed voices and tender intentness of the spectators.

The group has no repulsive aspect of death. The Mother's face is of extreme beauty, and the agony of the struggle has subsided in its expression, into a pensive remembrance of death. It is that fleeting moment of serene loveliness,

> "Before Decay's effacing fingers,
> Have swept the lines where beauty lingers."

It is fairly part of the success of art in the work, that the spectator who does not look with eyes alone, hears the sea, enamored of its own victim, remorsefully retreating ; for it is the remembrance of such deeds as this that gives its mysterious sadness to the voice of the sea. It is so skillfully wrought that no other sense of nudity remains than would be instinctive in every noble mind which came, unawares, upon a reality. And it has that final praise that it is real. It is the privilege and triumph of Art to touch even the saddest objects with a beauty which rises superior to every other emotion. The tranquil ease—the feminine loveliness—the aspect of the little child, whose agony was brief, and which rests as trustful in death as in life, within the maternal embrace—the tenderness which hushes the voice and the heart of the spectator, the fullness of the womanly form, the grace of the sweeps, the justice of the bold angles—these are all absorbed and make part of the impression of beauty which is supreme in the work.

We recommend it most sincerely to the public. It is a work which although in the strictest sense, classical, is of no country and of no special time. That it was made by an American is matter of satisfaction—and in some sense certifies

its value, because our genius for sculpture has been hitherto our distinction in the arts. The only foreign work of which it recalls the remembrance is the Dead Abel of a Florentine sculptor, whose name at this moment escapes us, and it is only as a figure of youth in death that there is any resemblance between the two. It is a finer sculpture than the traveler sees in most foreign studios, and shames, with its sad human reality, the throngs of conventional Psyches, Venuses and Nymphs which crowd the Italian ateliers. With this group and Delaroche's picture and the Cosmoramas of Sattler, the City has attractions not habitual to it, but which it is the influence of such works to keep it here permanently.

— As considerable many inquiries are made in regard to the Photographic Album, we last fall proposed to publish, we deem it necessary to state that we are ready at any time to go on with the work, so soon as we are insured against loss. It was proposed in the hopes that the Daguerrean art in this country would derive permanent benefit from it and that its utility and advantages would be at once seen and appreciated. A few of our Daguerreans have understood our motive and given us credit for it, in fact one has felt so favorable towards the undertaking, that he has not only offered to furnish all the daguerreotypes, but bear half the expense of publication, but as this course would entirely defeat the object of *general utility* which are had in view, we were obliged to decline, although he is a gentleman capable of fulfilling his engagements in every respect, not only to his own, but the country's honor.

We subjoin the only terms we are willing to adopt in publishing the Album, and will willingly let it rest with our Daguerrean artists to say whether it shall be issued or not.

In selecting the pictures for this work, the editor will be guided by the following rules:

1st. As each Daguerreotype is received, it will be numbered, and take precedence according to the number.

2d. Portraits only will be selected which excel in position, tone, and sharpness; Views, for their general interest and excellence of execution in every part.

3d. Those best calculated to copy by the Photographic process.

4th. Fancy Groups, calculated to improve the taste in position.

5th. Those possessing all the above requisites, and accompanied by a descriptive history of the picture, if a View or Group, and a brief biography if a Portrait. It is also recommended that a description of the process observed in executing the picture should accompany it, in order to make the work of practical utility.

As the copies of the Daguerreotypes selected will be made by some one, probably several of the Photographic processes, we must impress the necessity of having them perfect in every particular, as the least defect will oblige us to reject them.

6th. The Daguerrean's name will be attached to each picture.

7th. As the publication of this work will be attended with considerable expense, each Daguerrean whose picture is selected, will be charged twenty-five dollars, and a copy of the work sent him without extra charge.

— We called in upon Mead Brothers, a few days since, to look at two very fine specimens of double whole size pictures of Mrs. Forrest and Mad. Lola Montez. These daguerreotypists deserve great credit for these specimens, for they are good in tone, and with a slight fault in that of Lola Montez, excellent in position and finish.

— Mr. Moulthrop of New Haven, Ct., and Mr. Nichols of Fulton, N. Y., have exhibited to us some very fine specimens of the art, which stamp them both men of excellent judgment and refined tastes. We trust they may continue to prosper, despite of fifty cent operators.

with skeletons which really surpass that of man. These belong to animals which depend for subsistance upon their muscular powers, and with whom man is, in this particular, on no equality. What is the lord of the creation, compared with the antelope for fleetness, or with the elephant and many other animals for strength?

As we ascend the scale of animal life we find a more perfectly developed nervous system; and the relative size of the brain, compared with that of the brute, is found progressively to increase, until it arrives at the utmost perfection in man. On the system of nerves depends sensation, and there can be no doubt that the more exalted the order of intelligence displayed, the more exquisitely delicate is the nervous system. Thus, in this world, refined genius must necessarily be attended with a condition of sensibility which, too frequently to the possessor, is a state of real disease.

It must be evident to every reader that but very few of the striking features of animal life have been mentioned in the rapid survey which has been taken of the progress of animal organization. The subject is so extensive that it would be quite impossible to embrace it within any reasonable limits; and it furnishes matter so curious and so instructive, that, having once entered on it, it would have been difficult to have made any selection, and we must have devoted a volume to the Æsthetics of natural science. Passing it by, therefore, with the mere outline which has been given, we must proceed to consider some of the conditions of vitality.

Bell has proved that one set of nerves is employed in conveying sensation to the brain, and another set in transferring the desires of the will to the muscles. By the separation of the main branch of one of the nerves of sensation, although all the operations of life will still proceed, the organ to which that nerve goes is dead to its particular sense. In like manner, if one of the nerves of volition is divided, the member will not obey the inclination of the brain. It is evident, therefore, although many of the great phenomena of vital force are dependent on the nervous system, and the paralysis of a member ensues upon the separation or the disease of a nerve, that the nerves are but the channels through which certain influences are carried. The *vis vitæ*, or vital principle—for we are compelled by the imperfection of our knowledge to associate under this one term the ultimate causes of many of the phenomena of life—is a power which, although constantly employed, has the capability of continually renewing itself by some inexplicable connection existing between it and many external influences. We know that certain conditions are necessary to the health of animals. Diseased digestion, or any interruption in the circulation of the blood, destroys the vital force, and death ensues. The processes of digestion and of the circulation are perfectly understood, yet we are no nearer the great secret of the living principle.

Animals are dependent on several external agents for the support of existence. The oxygen of the air is necessary for respiration. Animal heat, as will be shown presently, is in a great measure dependent upon it. The external heat is so regulated that animal existence is comfortably supported. Electricity is without doubt an essential element in the living process; and, indeed, many physiologists have been inclined to refer vital force to the development of electricity by chemical action in the brain; for which, however, there is no foundation in experiment.

The phenomena of the Torpedo and Gymnotus we have already noticed, and there are other creatures which certainly possess the power of secreting and discharging electricity. Galvani's experiments and those of Aldini, appear to show—and the more delicate researches of Matteucci have satisfactorily determined—that currents of electricity are always circulating in the animal frame, that positive electricity is constantly passing from the interior to the exterior of a muscle; and Matteucci, by arranging a series of muscles, has formed an electric pile of some energy. These currents have been detected in man, in pigeons, fowls, eels, and frogs.

In the human body, it is evident a large quantity of electricity exists in a state of equilibrium. This, however, may be said of every substance. It is perhaps more easily disturbed in the human system; indeed, the manifestation of sparks from the hair and other parts of the body by friction is not uncommon. Every chemical ac-

tion, it has been already shown, gives rise to electrical manifestations; and the animal body is a laboratory, beautifully fitted with apparatus, in which nearly every chemical process is going on. It has been proved that acid and alkaline principles are constantly acting upon each other through the tissues of the animal frame; and we have curious phenomena of endosmose and exosmose in constant action, and catalysis operating in a mysterious manner.

With the refined physiological questions connected with the phenomena of sensation we cannot deal, nor will any argument be adduced for or against the hypothesis which would refer these phenomena to some extraordinary development of electric force in the brain. The entire subject appears to stand beyond the true limits of science, and every attempt to pass it is invariably found to lead to a confused mysticism, in which the real and the ideal are strangely confounded. Science stops short of the phenomena of vital action.

We cannot, however, but refer to the idea entertained by many that the brain is an electric battery, and the nerves a system of conductors. On this view, Sir John Herschel remarks: "If the brain be an electric pile constantly in action, it may be conceived to discharge itself at regular intervals, when the tension of the electricity reaches a certain point, along the nerves which communicate with the heart, and thus excite the pulsation of that organ." Priestly, however, appears to have been the first to promulgate this idea.

Light is an essential element in producing the grand phenomenon of life, though its action is ill understood. Where there is light there is life, and any deprivation, of this principle is rapidly followed by disease of the animal frame, and the destruction of the mental faculties. We have proof of this in the squalor of those whose necessities compel them to labor in places to which the blessings of sunshine never penetrate, as in our coal-mines, where men having everything necessary for health, except light, exhibit a singularly unhealthy appearance. The state of fatuity and wretchedness to which those individuals have been reduced, who have been subjected for years to incarceration in dark dungeons, may be referred to the same deprivation. Again, in the peculiar aspect of those people who inhabit different regions of the earth under varying influences of light, we see evidence of the powerful effects of solar action. Other forces, as yet undiscovered, may, in all probability do, exert decided influences on the animal economy; but, although we recognize many effects which we cannot refer to any known causes, we are perfectly unable to imagine the sources from which they spring.

It will be interesting now to examine the sources of animal heat, the consideration of which naturally leads us to consider the digestive system, the circulatory processes, and the effects of nervous excitation.

The theory, which attributes animal heat to the combination of the carbon of the food taken into the stomach with the oxygen of the air inspired through the lungs, has become a very favorite one. It must, however, be remembered that it is by no means a new one. The doctrines of Brown, known as the Brunonian system, and set forth in his *Elementa Medicinæ*, are founded upon similar hasty generalizations. Although, without doubt, true in a certain degree, it is not so to the extent to which its advocates would have us believe. That the carbonaceous matter received into the stomach, after having undergone the process of digestion, enters into combination with the oxygen breathed through the lungs or absorbed by the skin; and is given off from the body in the form of carbonic acid, and that, during the combination, heat is produced, by a process similar to that of ordinary combustion, is an established fact; but the idea of referring animal heat entirely to this chemical source, when there are other well-known causes producing calorific effects, is an example of the errors into which an ingenious mind may be led, when eagerly seeking to establish a favorite hypothesis.

Animal and vegetable diet, which is composed largely of carbon and hydrogen, passes into the digestive system, and becomes converted into the various matters required for the support of the animal structure. The blood is the principal fluid employed in distributing over the system the necessary elements of health and vigor, and for restoring the waste of the body. This fluid, in passing through the lungs, undergoes a very remarkable change, and not merely assumes a different color, but

really acquires new properties, from its exposure to the air with which the cells of these organs are filled. By a true chemical process, the oxygen is separated from the air, that oxygen is made to combine with the carbon and hydrogen, and carbonic acid and water are formed. These are liberated and thrown off from the body either through the lungs or by the skin. In the processes of life, as far as we are enabled to trace them, we see actions going on which are referred to certain causes which we *appear* to explain. Thus, the combination of the oxygen of the air with the carbon of the blood is truly designated a case of chemical affinity : and we find that, in endeavoring to imitate the processes of nature in the laboratory, we are, to a certain extent, successful. We can combine carbon and oxygen to produce carbonic acid ; and we know that the result of that combination is the development of certain definite quantities of heat. Let us examine the conditions of this chemical phenomenon, and we shall find that in the natural and artificial processes,—for we must be allowed to make that distinction,—there are analogous circumstances. If we place a piece of pure carbon, a lump of charcoal or a diamond, in a vessel of air or even of pure oxygen gas, no change will take place in either of these elements, and, however long they may be kept together, they will still be found as carbon or diamond, and oxygen gas. If we apply heat to the carbon until it becomes incandescent, it immediately begins to combine with the oxygen gas,—it burns ;—after a little time all the carbon has disappeared, and we shall find, if the experiment has been properly made, that a gas is left behind which is distinguished by properties in every respect the reverse of those of oxygen, supporting neither life nor combustion, whereas oxygen gives increased vigor to both. We have now, indeed, carbonic acid gas formed by the union of the two principles.

A dead mass of animal matter may be placed in oxygen gas, and, unless some peculiar conditions are in some way brought about, no change will take place ; but, if it were possible to apply the spark of life to it, as we light up the spark in the other case, or if, as that is beyond the power of man, we substitute a living creature, a combination between the carbon of the animal and the gas will immediately begin and carbonic acid will be formed by the waste of animal matter, as in the other case it is by the destruction of the carbon ; and if there is not a fresh supply given, the animal must die, from the exhaustion of its fabric. Now, in both these cases, it is clear that, although this chemical union is a proximate cause of animal heat, there must be existing some power superior to it, as the ultimate cause thereof.

The slow combustion (eremacausis) of vegetable matter, decomposing under the influence of moisture and the air, does not present similar conditions to those of the human body, although it has been insisted upon to be in every respect analogous. That the results resemble each other is true, but we must carefully distinguish between effects and causes ; and the results of chemical decomposition in inert matter differ from those in the living organism. The vegetable matter has lost the principle of organic life, and that gone, the tendency of all things being to be resolved into their most simple forms, a disunion of the elements commences : oxygen and hydrogen escapes from the carbon, and pass off either in the gaseous state or as water, whilst the carbon is liberated in a very finely-divided condition, and enters slowly into combination with oxygen supplied by the water or the air. Hydrogeneous compounds are at the same time formed, and, under all these circumstances, as in all other chemical phenomena, an alteration of temperature results.

The animal tissue may act in the same way as platina has already been shown to act in producing combination between gases ; but of this we have no proof. We know that electricity is capable of producing the required conditions, and we also learn, from the beautiful researches of Faraday, that the quantity of electricity developed during decomposition, is exactly equal to that required to effect the combination of the same elements. Thus it is quite clear that, during the combination of the carbon of the blood with the oxygen of the air, a large amount of electricity must become latent in the compound. The source of this we know not : it may be derived from some secret spring within the living structure, or it may be gathered from the matter surrounding it. There is much

in nervous excitation which appears like electrical phenomena, and attempts have been frequently made to refer sensation to the agency of electricity. But these are the dreams of the ingenious, for which there is but little waking reality.

Every mechanical movement of the body occasions the development of heat; every exertion of the muscles produces sensible warmth; and, indeed, it can be shown by experiment that every expansion of muscular fibre is attended with the escape of caloric, and its contraction with the absorption of it. There are few operations of the mind which do not excite the latent caloric of the body, and frequently we find it manifested in a very remarkable manner by a suddenly-awakened feeling. The poet in the pleasure of creation glows with the ardor of his mind, and the blush of the innocent is but the exhibition of the phenomenon under some nervous excitation, produced by a spirit-disturbing thought. Thus we see that the processes of digestion and respiration are not the only sources of animal heat, but that many others exist, to which much of the natural temperature of the body must be referred.

So much that is mysterious belongs to the phenomena of life, that superstition has had a wide scope for the exercise of its influence; and through all ages a powerful party of mankind have imagined that the spirit of human curiosity must be checked before it advances to remove the veil from any physiological causes. Hence it is that even at the present day so much that stands between what, in our ignorance, we call the real and the supernatural, remains uninvestigated. Even those men whose minds are skeptical upon any development of the truths of great natural phenomena, —who, at all events, will have proof before they admit the evidence, are ready to give credit to the grossest absurdities which may be palmed upon them by ingenious charletans, where the subject is man and his relations to the spiritual world.

Man, and the races of animals by which he is surrounded, present a very striking group, consider them in whatever light we please. The gradual improvement of organic form, and the consequent increase of sensibility, and eventually the development of reason, are the grandest features of animated creation. The conditions as to number even of the various classes are not the least remarkable phenomena of life. In the lowest orders of animals, creatures of imperfect organization,—consequently those to whom the conditions of pain must be nearly unknown,—increase by countless myriads. Of the infusoria and other beings, entire mountains have been formed, although microscopes of the highest powers are required to detect an individual. Higher in the scale, even among insects, the same remarkable conditions of increase are observed. Some silkworms lay from 1,000 to 2,000 eggs; the wasp deposits 3,000; the ant from 4,000 to 5,000. The queen bee lays between 5,000 and 6,000 eggs, according to Burmeister; but Kirby and Spence state that in one season the number may amount to 40,000 or 50,000. But, above all, the white ant (*Termes fatalis*) produces 86,400 eggs each day, which, continuing for a lunar month, gives the astonishing number of 2,419,200, a number far exceeding that produced by any known animal

These may appear like the statements in which a fictionist might indulge, but they are the sober truths discovered by the most pains-taking and cautious observers. And it is necessary that such conditions should prevail. These insects, and all the lower tribes of the animal kingdom, furnish food for the more elevated races. Thousands are born in an hour, and millions upon millions perish in a day. For the support of organic life, like matter is required; and we find that the creatures who are destined to become the prey of others, are so constituted that they pass from life with a perfect unconsciousness of suffering. As the animal creation advances in size and strength, their increase becomes limited; and thus they are prevented from maintaining by numbers that dominion over the world which they would be enabled from their powers to do, were their bands more numerous than we now find them.

The comparative strength, too, of the insect tribes has ever been a subject of wonder and of admiration to the naturalist. The strength of these minute creatures is enormous; their muscular power, in relation to their size, far exceeds that of any other animal. The grasshopper will spring two hundred times the length of its own body. The dragon-fly, by its strength of

THE

PHOTOGRAPHIC ART-JOURNAL.

Vol. 3. MAY, 1852. No. 5.

THE POETRY OF SCIENCE, OR STUDIES OF THE PHYSICAL PHENOMENA OF NATURE.*

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THE polypes are a remarkably curious class, "Fixed in large arborescent masses to the rocks of tropical seas, or in our own climate attached to shells or other submarine substances, they throw out their ramifications in a thousand beautiful and plant-like forms; or, incrusting the rocks at the bottom of the ocean with calcareous earth, separated from the water which bathes them, they silently build up reefs and shoals, justly dreaded by the navigator; and sometimes giving origin, as they rise to the surface of the sea, to islands, which the lapse of ages clothes with luxuriant verdure, and peoples with appropriate inhabitants." Most of the polypes are fixed and stationary; but the hydra and some others have the power of changing their positions, which they do in search of the light of the sun. They do not appear to have organs of sight requiring light; but still they delight in the solar influences. The most extraordinary fact connected with the hydra is its being multiplied by division. If an incision be made in the side of a hydra, a young polype soon developes itself; and if one of these creatures be divided, it quickly restores the lost portion of its structure. The varieties of the polypes are exceedingly numerous, and many of them are in the highest degree curious, and often very beautiful. The actinæ, like flowers, appear to grow from the rocks, unfolding their tentacula to the light; and in their eagerness for prey, they exhibit a beautiful play of colors, and most interesting forms. Microscopic zoophytes of the most curious shapes are found,—all of which attest, under examination, the perfection of all created things.

Infusoria and animalcula,—animals, many of them, appearing under the microscope as little more than a transparent jelly,—must be recognised as the most simple of the forms of life. They exist in all waters in uncountable myriads; and, minute creatures as they are, it has been demonstrated that many of the great limestone hills are composed entirely of their remains.

The acalephæ, or the phosphorescent animals of the ocean, are no less curious. From creatures of the most minute size, they extend to a considerable magnitude, yet they appear to be little more than animated masses of sea-water. If any one of these sea-jellies, or jelly-fishes, as they are often called, is cast upon the shore, it is soon, by the influence of the sun, converted into a mere fibre no thicker than a cobweb: an animal weighing seven or eight pounds is very soon reduced to little more than as many grains. There are numerous varieties of these singular creatures most of which are remarkable for the powerful phosphorescent light they emit. The beroes and the pulmonigrade shine with an intense white light many feet below the surface, whilst the *Cestum Veneris*, or

* Continued from vol. 3, No. 4, p. 197.

girdle of Venus, gliding rapidly along presents on the edge of the wave, an undulating riband of flame of considerable length. There can be no doubt that this arises from the emission of phosphorescent matter of an unknown kind from the bodies of these animals.

The microscope has made us familiar with the mysteries of a minute creation which we should not otherwise have comprehended. These creatures are found inhabiting the waters and the land, and they exist in the intestinal structure of plants and animals, preying upon the nutritive juices which pass through their systems. Although these beings are so exceedingly small that even the most practised observer cannot detect them with the naked eye, they are proved, by careful examination under the microscope, to be in many cases elaborately organized. Ehrenberg has discovered in them filamentary nerves and nervous masses, and even vessels appropriated to the circulation of fluids, showing that they belong really to a high condition of existence.

Passing over many links in that curious chain which appears to bind the animal kingdom into a complete whole, we come to the articulata of Cuvier—the homogangliata of Owen.

All those creatures which we have been hitherto considering, are too imperfect in the construction of their simple organizations to maintain a terrestrial existence; they are, therefore, confined to a watery medium. In the articulata, we have evidences of higher attributes, and indications of instincts developed in proportion to the increased perfection of organization. Commencing with the annelidans, all of which, except the earthworms, are inhabitants of the waters, we proceed to the myriapoda, presenting a system intermediate in every respect between that of worms and insects; we then find embraced in the same order, the class insecta, which includes flies and beetles of all kinds; and as the fourth division of articulated beings, the arachnidans, or spiders; and, lastly, the marine tribe of crustaceans.

The most remarkable phenomena connected with these animals are the metamorphoses which they undergo. The female butterfly, for instance, lays eggs, which, when hatched, produce caterpillars: these live in this state for some time, feeding upon vegetables, and, after casting their skins as they increase in size, at last assume an entirely different state, and, dormant in their oblong case, they appear like dead matter. This chrysalis, or pupa, is generally preserved from injury by being embedded in the earth, from which, after a season, a beautifully perfect insect escapes, and, floating on the breeze of summer, enjoys its sunshine, and revels amidst its flowers.

No less remarkable is the metamorphosis of the caducibranchiate amphibia, passing through the true fish condition of the tadpole to the perfect air-breathing and four-footed animal, the frog.

A metamorphosis of the crustaceans, somewhat similar to that which takes place in insects, has been of late years creating much discussion amongst naturalists; but the question appears to be now settled by the careful and long-continued observations of Mr. Thompson, and Mr. R. C. Couch.

A wide line of demarcation marks the separation of the invertebrata from the four great classes of vertebrate animals—fishes, reptiles, birds, and mammalia. Every part of the globe,—the ocean and the inland lake—the wide and far winding river, and the babbling stream,—the mountain and the valley,—the forest with its depth of shade, and the desert with its intensity of light,—the cold regions of the frost-chained north, and the fervid clime within the tropics—presents for our study innumerable animals, each fitted for the conditions to which it is destined; and through the whole we find a gradual elevation in the scale of intelligence, until at last, separated from all by peculiar powers, we arrive at man himself. In each of these four classes, the animals are furnished with a bony skeleton, which is in the young animal little more than cartilage; but, as growth increases, lime becomes deposited, and a sufficient degree of hardness is thus produced to support the adult formation. Some anatomists have endeavored to show that even in the mechanical structure of the bony fabrics of animals, we are enabled to trace a gradual increase in the perfection of arrangement, from the fish until the most perfect is found in man. Many of the mammalia, however, are furnished

wing, will sustain itself in the air for a long summer day with unabated speed. The house-fly makes six hundred strokes with its wings, which will carry it five feet, every second.

Such are the wonders of the natural world; from the zoophyte, growing like a flowering plant upon an axis filled with living pith—a small remove from the conditions of vegetable life, upwards through the myriads of breathing things—to man, we see the dependence of all upon these physical powers which we have been considering.

To trace the effects of these great causes through all their mysterious phases is the work of inductive science; and the truths discovered tend to fit us for the enjoyment of the eternal state of high intelligence to which every human soul aspires.

That which the ignorant man calls the supernatural, the philosopher classes amongst natural phenomena. The ideal of the credulous man becomes the real to one who will bend his mind to the task of inquiry. Therefore, to attempt to advance our knowledge of the unknown, to add to the stores of truth, is an employment worthy the high destiny of the human race. Remembering that the revelations of natural science cannot in any way injure the revelation of eternal truth, but, on the contrary, aid to establish in the minds of the doubting a firm conviction of its Divine origin and of man's high position, we need never fear that we are proceeding too far with any inquiry so long as we are cautious to examine the conditions of our own minds, that they may not be made the dupe of the senses.

In the faries of the hills and valleys, in the gnomes of the caverns, in the spirits of the elements, we have the attempts of the mind, when the world was young, to give form to the dim outshadowings of something which was then felt to be hidden behind external nature.

In the Oread, the Dryad, and the Nereid, we have, in like manner, an embodiment of powers which the poet-philosopher saw in his visions presiding over the mountain, the forest, and the ocean. Content with these, invested as they were with poetic beauty, man for ages held them most religiously sacred; but the progress of natural science has destroyed this class of creations. "Great Pan is dead," but the mountains are not voiceless; they speak in a more convincing tone; and, instead of the ear catching the dying echo of an obscure truth, it is gladdened with the full, clear note of Nature, in the sweetest voice, proclaiming secrets which were unknown to the dreams of superstition.

CHAPTER XVI.

GENERAL CONCLUSIONS.

The Changes produced on Physical Phenomena by the movement of the Solar System considered—Exertion of the Physical Forces through the celestial Spaces—The Balance of Powers—Varieties of Matter—Theory of Nonentity—A Material Creation, an indisputable Fact—Advantages of the Study of Science—Conclusion.

We have examined terrestrial phenomena under many of the harmonious conditions which, with our limited intelligence, we can reach by the aid of science. From the first exhibition of force, in the cohesion of two atoms, onward to the full development of organic form in the highest order of animals, we have observed strange influences. We have seen the solitary molecule invested with peculiar properties, and regulated by mighty forces; we have learned that the modes of motion given to this beautiful sphere produce curious changes in the operation of these powers; and we may with safety infer that every atom constituting this globe is held in wonderful suspension against every atom of every star, in the celestial spaces, even to that bright orb in the centre of Pleiades, around which the entire system of created worlds is supposed to roll.

As we move around our own sun—in the limited period of 365 days—we experience transitions from heat to cold, dependent upon our position in regard to that luminary. May we not therefore conclude, without being charged with making any violent deduction, that, in the great revolution of our system around the centre of space, we are undergoing gradual changes which are essential to the great scheme of creation, though at present incomprehensible to us?

In our consideration of the influence of time on the structure of the earth as we find it, we discover that, in ages long past, the vegetation of the tropics existed upon

these northern parts of the globe ; and the geological research has also proved that over the same lands the cold of an arctic winter must have long prevailed—the immense glaciers of that period having left the marks of their movements upon the face of the existing rocks. We know that during 3,000 years no change of temperature has taken place in the European climate. The children of Israel found the date and the vine flourishing in Canaan ; and they exist there still. Argo has shown that a trifling alteration of temperature would have destroyed one or the other of these fruit-bearing trees, since the vine will not ripen where the mean temperature of the year is higher than 84°, or the date flourish where it sinks below that degree.

How immense, then, the duration of time since these changes must have taken place ! The 432,000 years of Oriental mythology is a period scarcely commensurable with these effects ; yet, to the creature of threescore years, that period appears an eternity. The thirty-three millions of geographical miles which our solar system traverses annually, if multiplied by three thousand years during which we know no change has taken place, give us 99,000, 000,000 as the distance passed over in that period. How wide, then, must have been the journey of the system in space to produce the alteration in the physical powers, by which these changes have been effected !

We have an example, and a striking one, of the variations which may be produced in all the physical conditions of a world, in those disturbances of Uranus which led to the discovery of Neptune. For thirty years or more certain perturbations were observed in this distant planet, the discovery of Sir William Herschel, and calculation pointed to some still more remote mass of matter as the cause, which has been verified by its actual discovery. But now Uranus is at rest ;—quietly that star progresses in its appointed orbit,—Neptune can no longer cause it to rock upon its centre,—they are too remote to produce any sensible influence upon each other. Consequently, for thirty years, it is evident, phenomena must have occurred on the surface of Uranus, which can be no longer repeated until these two planets again arrive at the same positions in their respective paths which they have occupied since 1812. These considerations assist us in our attempts to comprehend infinite time and space ; but the human mind fails to advance far in the great sublimity.

Through every inch of space we have evidence of the exercise of such forces as we have been considering. Gravitation chains world to world, and holds them all suspended from the mystic centre. Cohesion binds every mass of matter into a sphere. Heat, radiating from one planet to another, does its work in all, giving variety to matter. Light seeks out every world—each trembling star tells of the mystery of its presence. Where light and heat are, chemical action, as an associated power, must be present; and electricity must do its wondrous duties amongst them all. Modified by peculiar properties of matter, they may not manifest themselves in phenomena like those of our terrestrial nature ; but the evidence of light is a sufficient proof of the presence of its kindred elements; and it is difficult to imagine all these powers in action without producing some form of organization. In the rounded pebble which we gather from the seashore,—in the medusa floating bright with all the beauty of prismatic color in the sunlit sea,—in the animal, mighty in his strength, roaming the labyrinthine forests, or, great in intelligence, looking from this to the mysteries of other worlds,—in all created things around us, we see direct evidence of a beautiful adjustment of the balance of forces, and the harmonious arrangement of properties.

One atom is removed from a mass and its character is changed ; one force being rendered more active than another, and the body, under its influence, ceases to be the same in condition. The regulation which disposes the arrangements of matter on this earth, must exist through the celestial spaces, and every planet bears the same relation to every other glittering mass in heaven's o'erarching canopy, as one atom bears to another in the pebble, the medusa, the lion, or the man. An indissoluble bond unites them all, and the grain of sand which lies buried in the depth of one of our primary formations holds, chained to it by these all-pervading forces, the uncounted worlds which, like luminous sand, are sprinkled by the hand of the Creator

through the universe. Thus we advance to a conception of creation.

The vigorous mind of that immortal bard who sang "of man's first disobedience," never, in the highest rapture, the holiest trance of poetic conception, dreamed of any natural truths so sublime as those which science has revealed to us.

The dependence of all the systems of worlds upon each other, every dust composing each individual globe being "weighed in a balance," the adjustment of the powers by which every physical condition is ordered, the disposition of matter in the mass of the earth, and the close relation of the kingdoms of nature,—are all revelations of natural truths, exalting the mind to the divine conception of the universe.

There is a remarkable antagonism displayed in the operation of many of these forces. Gravitation and cohesion act in opposition to the repellent influences of caloric. Light and heat are often associated in a very remarkable manner, but they are certainly in their radiant states in atagonism to chemical action, whether produced by the direct agency of actinic force, or through the intermediate excitement of the electrical current. And in relation to chemical force, as manifested in organic combinations, we have the all-powerful operation of LIFE preventing any exercise of its decomposing power. As world is balanced against world in the universe, so in the human fabric, in the vegetable structure, in the crystallized gem, or in the rude rock, force is weighed against force, and the balance hangs in tranquillity. Let but a slight disturbance occasion a vibration of the beam, and electricity shakes the stoutest heart with terror, at the might of its devastating power. Heat melts the hardest rocks, and the earth trembles with volcanic agency, being freed from its chains, speedily spreads decay over the beautiful, and renders the lovely repulsive.

We know matter in an infinite variety of forms from the most ponderous metal to the lightest gas; and we have it within our power to render the most solid bodies invisible in the condition of vapor. Is it not easy, then, to understand that matter may exist equally attenuated in relation to hydrogen, as that gas itself is, when compared with the metal platinum? A doubt has been raised against this view, from the difficulty of accounting for the passage of the physical elements through solid masses of matter. If we, however, remember that the known gases have the power of transpiration through matter in a remarkable degree, and that the passage of water through a sieve may be prevented it will be at once apparent that permeation of any radiant body through fixed solid matter, is entirely a question of conditions.

We can form no idea of the size of the ultimate atom; we cannot comprehend the degree of etherealization to which matter may be extended. Our atmosphere, we have seen, is only another condition of the same elements which compose all the organized forms of matter upon the earth, and, at the height reached by man, it is in a state of extreme attenuation. What must be its condition at the distance of forty miles from the earth? According to known laws, certain phenomena of refraction have led us to set these bounds to the matter constituting our globe: but it may exist in such a state of tenuity, that no philosophical instrument constructed by human hands could measure its refracting power; and who shall declare with certainty that matter itself may not be as far extended as we suppose its influences to be?

"Hast thou perceived the breadth of the earth?" declare, if thou knowest it all.

"Knowest thou the ordinances of heaven? Canst thou set the dominion thereof in the earth?"

A cheerless philosophy would teach us to regard all this as the mere exhibition of properties, a manifestation of powers: it believes not in a material creation. The grandeur of the earth, and the beautiful forms adorning it, are not entities. Yonder exquisite specimen of the skill of man, in which mind appears to shine through the marble,—that distant mountain which divides the clouds as they are driven by the winds across it,—those trees, amid whose branches the birds make most melodious music,—this flower, so redolent of perfume, so bright in color, and so symmetric in form,—and that lovely being who, a model of beauty and grace, walks the earth an impersonation of love and charity blended, making, indeed, "a sunshine in a shady place," are not realities. Certain forces combine to produce effects, all of which unite to deceive poor man into

the belief that he is a material being, and the inhabitant of a material world. There may be ingenuity in the philosophy of this school; its metaphysics may be of a higher order; but it evidently advances from the real to the ideal with such rapidity, that every argument is based on an assumption without a proof; every assumption being merely a type of the philosophy itself,—a baseless fabric, a transcendental vision.

A material creation surrounds us. This earth, and all that it contains, and the immense host of steller worlds, are absolute entities, surrounded with, and interpenetrated by, certain exhibitions of creative intelligence, which perform, according to fixed laws, the mighty labors upon which depend the infinite and eternal mutations of matter. The origin of a grain of dust is hidden from our finite comprehensions; but its existence should be a source of hope, that those minds which are allowed the privilege of tracing out its marvellous properties,—of examining the empyreal principles upon which its condition, as a grain of dust, depends,—and even of reducing these giant elements to do our human bidding,—may, after a period of probation, be admitted to the enjoyment of that infinite power to which the great secrets of creation will be unveiled.

Every motion which the accurate search of the experimentalist has traced, every principle of power which the physicist has discovered, every combination which the chemist has detected, every form which the naturalist has recorded, involves reflections of an exhalting character, which constitute the elements of the highest poetry. The philosophy of physical science is a grand epic, the record of natural science a great didactic poem.

To study science for its useful applications merely, is to limit its advantages to purely sensual ends. To pursue science for the sake of the truths it may reveal, is an endeavor to advance the elements of human happiness through the intelligence of the race. To avail ourselves of facts for the improvement of art and manufactures, is the duty of every nation moving in the advance of civilization. But to draw from the great truths of science intelligible inferences and masterly deductions, and from these to advance to new and beautiful abstractions, is a mental exercise which tends to the refinement and elevation of every human feeling.

The mind thus exercised during the midday of life, will find in the twilight of age a divine serenity; and, charmed by the music of nature, which like a vesper hymn poured forth from pious souls, proclaims in devotion's purest strain the departure of day, he will sink into the repose of that mysterious night which awaits us all, tranquil in the happy consciousness that the sun of truth will rise in unclouded brilliancy, and place him in the enjoyment of that intellectual light, which has ever been among the holiest aspirations of the human race.

The task of wielding the wan of science, —of standing a scientific evocator within the charmed circle of its powers, is one which leads the mind through nature up to nature's God.

Experiment and observation instruct us in the discovery of a fact;—that fact connects itself with natural phenomena,—the ultimate cause of which we learn from Divine revelation, and receive in full belief, —but the proximate causes are reserved as trials of man's intelligence; and every natural truth, discovered by induction, enables the contemplative mind to deduce those perfect laws which are exemplications of the fresh-springing and all-enduring POETRY OF SCIENCE.

PRODIGALS, says Taylor:

"Wear a farm in shoe-strings edged with gold,
And spangled garters worth a copyhold;
A hose and doublet which a lordship cost:
A gaudy cloak three mansions' price almost;
A beaver band and feather for the head,
Prized as the church's tythe, the poor man's bread."

PREPARING PLATES BY STEAM.

BY J. A. WHIPPLE.

BY many daguerreotypers it is thought impossible to prepare daguerreotype plates by power with that degree of perfection that they can be by hand. This is a mistaken idea, as I can prove to any one in a few minutes who will call at my rooms and see the operation of machinery for that purpose. I have now had steam power in successful operation for the past four years, and can with truth say, I should hardly know how to work were I to go back to the tedious old way of scouring and scrubbing and hand-buffing principle. Its advantage on the score of economy as well as ease. and expedition are very great; for the small sum of twenty-five cents for coal I can keep my engine going from morning till night, one boy can tend it and scour more plates for buffing than three operators could use. The buffs being put in motion by steam all that is necessary is for the plate to be held upon them; one can buff and coat as many plates as a third person can sit, and when a regular system is adhered to (without which no operator can succeed) the results are always as uniform and successful as could be desired. When I first commenced I had the greatest difficulty in making a scouring apparatus that would answer and do as well as by hand; the buffs were easy enough to manage I tried various methods without success and was on the point of giving it up when a happy thought presented itself, to use an air cushion. I tried it; it worked to a charm, nothing could be better; by graduating it, the softest touch only could be given; or by condensing the air it could be made as hard as a board for cutting away fast. I also found that great speed was very advantageous; the spindle upon which the air-cushion is placed makes from 12 to 1500 revolutions per minute; this will give results that cannot be obtained otherwise, and by this means double wholes or whole plates can be made ready for the buffs in so short a time as to astonish one who is used only to cleaning by hand. My engine is 3¼ in. diameter of cylinder, and 6 inches stroke, running about 150 revolutions per minute, and is rated at one horse power. The boiler is an upright tubular one somewhat resembling a large stove, eighteen inches diameter and five feet high. Many think the escape of steam in a daguerreotype room is sure to prevent good results. I have not found it so; the vapor arising from water boiling in an open vessel is a very different affair from that escaping from under high pressure, the electrical state of the latter is entirely changed. When a kettle of water boiling upon a stove in my buffing room would cause trouble, great quantities of steam from the boiler does no harm; at least this has been my experience. Heating the mercury by steam I have found a most excellent plan; it is not a little too hot or a little too cold; it is one of the few things in daguerreotyping that can be depended upon; it is always *just right* the heat varying but the least degree with the variation of the barometer, which practically is of account, the atmospheric pressure changing so slightly and at comparatively long intervals.

The way I arrange it, is simply to solder upon the bottom of my mercury bath a small cup and connect it with a pipe to my boiler having no other pipe to carry the waste steam and condensed water away, letting on just steam enough to keep the waste pipe hot, I am then sure that all is right.

After enumerating the many and great advantages of steam, I should be doing injustice not to say that to manage it with success and profit, it is absolutely necessary that one should have the most thorough *practical* knewledge of all its operations, otherwise it would be attended only with vexation and annoyance, not to say danger. To illustrate, I will give a specimen of my first operation. This boiler was put in place, the engine connected

with suitable pipes and bolted to the floor. The boiler being new, leaked, and to prevent this a few handfuls of meal was put in, which had the desired effect; a fire was kindled, and presently the steam began to roar—in a close room it was frightful, especially to one unaccustomed to it. After putting the fire out and somewhat quelling its fury, steam was let on, the wheels began to move a little *too* fast; in endeavoring to shut it off the wrench slipped and fell, and by the time it was replaced the engine had gained such headway that it broke its fast enings which were insufficient, and jumped like a race horse—then came the finale; the weight was shaken from the safety-valve, the hot water and steam came rushing and roaring out in torrents, drenching us from head to foot and wetting nearly everything in the room. If the meal had not been added, steam only would have escaped doing little or no harm. However, after a few weeks use, one becomes accustomen to its management, and can tend it with the same regularity and certainty as he would mercuralize a plate after sitting. In fact, a regular system is everything in a daguerreotype establishment as well as in a merchant's counting-room, and without it no one can expect to prosper. I shall take pleasure in showing my apparatus to those who may have a desire to see it.

REVIEW OF THE REPRODUCTION BY M. NIEPCE DE ST. VICTOR, OF ENGRAVED IMAGES, DESIGNED OR PAINTED.

BY M. E. CHEVREUL.

IF new and unthought of phenomena were sufficient to impart to experiments all the interest which is capable of satisfying genuine curiosity, I would have nothing to add to the statement of M. Niepce de St Victor's works, as drawn out and submitted to the Academy; but for the originality of their results, for their present importance, and that which they will sooner or later attain, these works have appeared to me to justify the review which will not be judged superfluous by those who endeavor to join new facts with those which we have already acquired, so as to establish the unanimity of efforts by which the field of science is constantly enlarged, as if cultivated by a single intellect.

2. It is very necessary that chemists and philosophers should give a similar attention to the different kinds of molecular action as they present themselves to their observation.

3. The actions in virtue of which indefinite combinations take place, such as most of the metallic alloys, the solution of solid bodies or elastic fluids in neutral liquids, and the solid compounds produced by cementation, as steel, have at once fixed the attention of chemists and several philosophers, since it seems in effect that, in the indefinite compounds, the weakening of their molecular action resembles the phenomena of those which are treated of in the science of natural philosophy.

5. The molecular actions by which bodies dissolved in liquids are fixed with solids, without the form of these latter appearing to change, as that which happens to materials tinted in colored baths, have not been much investigated up to the present time except by the small number of chemists who have devoted their attention to the theory of dyeing. I cite these compounds to illustrate those combinations particularly which I attribute to capillary affinity because it is essential for the molecules of a coloring substance to enter without integration into combination with a body.

6. In regard to the molecular actions by virtue of which water imparts to the

animal tissues the necessary properties to fulfil the object which their organization imposes upon them in the phenomena of life, to different inorganic pulverulent bodies the property of constituting tenacious and ductile pastes, they have still more rarely been the subjects of study than the preceding.

7. Finally, chemists as well as philosophers are engaged in the examination of the actions which certain solids, especially those which are porous or reduced to impalpable powder, exert upon the elastic fluids; and their attention is particularly fixed upon the phenomena manifested during the action, rather than by the permanent properties acquired by the body participating in such actions;—a result very easily accounted for, when we consider that in the opinion of a great many chemists, the affinity depending upon definite combinations does not exist in the instance of which we speak.

8. We positively see how, within a certain limit of molecular actions, the chemist and the philosopher interferes with the practice of phenomena which according to many would be exempt from affinity properly so called, and which would consequently return again to the class of purely physical actions. Although this may be the opinion, the productions of these actions have not a character of permanence in their properties, or a constitution susceptible of being determined in such a precise manner, that we can compare them to the properly styled chemical compounds, or to those even in which the elements are indefinite.

9. I have thought it a duty to call attention to this state of science, with the hope of showing its connection with the researches of M. Niepce de Saint Victor; because in the experiments which he has described, the influence of affinity is indisputable. It is formed of definite compounds analogous to those which are produced by dyeing when the materials are combined with acids, bases, salts, and coloring principles, without changing from their solid state; besides, vapors are fixed with solids by virtue of an attractive force sufficient to overcome a part of their tension only, so that, in the void or in a space which is below a certain limit of saturation of this same vapor, solids allow the whole, or at least partial, exhalation of the vapor which they had first fixed.

10. To be more explicit, I will divide M. Niepce de St. Victor's experiments into three categories.

In the *first*, I will comprise those which relate to reproduction, by means of iodine, of engravings, designs, prints, etc., upon paper sized with a solution of starch and alumina, or upon a coating of starch baked and adherent to a smooth surface of glass or porcelain.

In the *second*, I will comprise experiments in which the object is the reproductions of a design, engraving, print, etc., upon a polished metallic surface by means of different elastic fluids.

In the *third*, I will speak of the reproduction of images at the focus of the camera-obscura, by means of a silver compound applied upon an albuminous coating instead of upon the paper.

FIRST CATEGORY OF EXPERIMENTS.

Reproduction by means of Iodine, of an Engraving, Design, Print, etc., upon Paper Sized in a Vat with Starch and Alumina, or upon a Coating of Starch baked and adherent to a smooth surface of Glass or Porcelain.

11. When we expose a very dry paper, containing an image, engraved, designed, or printed, to the vapor of iodine, the vapor fixes itself to the dark parts of the paper, in preference to the white parts: however, it fixes itself a little upon the latter, as manifested by a yellow tint when the exposition to the vapor has been sufficiently prolonged to insure the success of the reproduction on paper.

If we apply the image, properly iodized, upon a paper which contains the starch, and moistened with water, sharpened with pure sulphuric acid, or, what is more preferable, upon an even coating of baked starch fixed upon glass or porcelain, likewise moistened with acidulated water, the iodine leaves the material of the image to constitute with the starch the blue or blue-violet compound so universally known. The first proofs should always be rejected, because the whites are colored by the small quantity of the vapor of iodine which is fixed to the white parts of the original image. We cannot behold without astonishment the fidelity with which the most

delicate lines of the original are copied in the proofs afterwards obtained.

12. In a scientific point of view, the study of this reproduction is very interesting. Indeed, when the model is exposed to the iodine vapor, the darks are affected by it in preference to the whites; but we would not say that this may take place to the exclusion of the whites; for by prolonging the exposition, these last are colored orange, yellow, and brown, by the iodine vapor which is condensed on them. What truths therefore present themselves in the experiments of M. Neipce?

I. It is that the darks absorb the iodine vapor quicker than the whites, and in a greater proportion; consequently, by exposing an engraving to the iodine vapor an insufficient time for the coloration of the whites, the iodized darks alone can reproduce their image.

II. It is that if an engraving has been exposed to the vapor of iodine long enough for the whites to become iodized, by maintaining it in the open air a suitable time, the iodine leaves the whites, while it remains long enough in the darks for these to reproduce their image.

13. All these effects are manifested by taking them at an even temperature, and by placing them face to face in diffuse light or in darkness, in air or in a vacuum.

14. *Conclusion.* That there is an attractive force in the matter of the darks capable of overcoming the repulsive force of the iodine vapor. This force exists in the white matter of the paper, but in a more feeble degree. It is identical with that which effects the condensation of elastic fluids at the surface of bodies. If we confound it with affinity, its action is more feeble in the phenomena of which we speak. (4 and 7.)

15. The attractive force in virtue of which the darks fix the vapors of iodine, is also manifested when we plunge the engraving in iodine water for four minutes. The iodine quits its solvent to unite with the matter of the darks, and the engraving submitted to the water then reproduces its image upon the coating of starch, in the same manner as if it had been previously exposed to the iodine vapor.

16. These experiments are of the greatest interest for the theory of dyeing, for an engraving, in connection with iodine dissolved in water, the darks of which attract more powerfully than the whites, is somewhat similar in its effects upon cotton cloth, upon which we apply the mordants of alumina, peroxide of tin, peroxide of iron, etc., by means of an engraved cylinder, which fixes the mordant parts. If the operation be not prolonged, and if the coloring principles are not in excess, the parts of the cloth upon which the mordants have not been applied, will not be colored, neither will the whites of the engraving attract the iodine. But in the contrary instance, the whites will loose their coloring principles by exposure to atmospheric agents or by a dilute bath of chlorine, as the whites of an iodized engraving will lose their iodine by exposing it to the air, or by a simple washing in water.

17. The darks of an engraving fixing the iodine in the state of vapor, as well as iodine in aqueous solution, establishes a new relation between the phenomena of condensation of an elastic fluid by a solid, and the phenomena of fixation by a solid dissolved in a liquid.

18 Finally the iodine, fixed to the darks, leaves them, at least in part, to fix itself upon the moistened starch coating upon paper, upon a plate of glass, or even upon a plate of porcelain, and it reproduces the image of the darks of a blue violet color, forming the iodide of starch—familiar to all those who turn their attention to chemistry.

If wet starch has a greater affinity for the iodine than the material of the engraving, copper in its turn has a greater affinity still than starch for the same body. Nothing can be more interesting than the following experiments of M Niepce de St. Victor which proves this fact:

First experiment.—An iodized engraving is applied upon a coating of wet starch adherent to a plate of copper; and the iodine quits the darks, passes through the starch to the metallic surface with which it unites and forms the image.

Second experiment.—A blue violet image of iodide of starch upon glass is moistened and then applied upon a plate of copper. The colored image vanishes by degrees, in order to reproduce upon the plate the iodide of copper.

19. In a chemical and mechanical point of view there are certainly few phenome-

na so remarkable as that succession of fixation and displacement of iodine due to the relative attractive force which other bodies have for it; thus, the dark material of an engraving attracts it more than white paper, recollecting at the same time the action of porous bodies upon vapors and that of the mordants upon the coloring principles which are dissolved in water. The wet starch, carrying off the iodine from the dark matter of the engraving, forms a blue iodide, the composition appears very definite. Finally, the copper removing in its turn the iodide from the starch, undoubtedly constitutes also with a definite compound, and it is worthy of notice, that in all its displacements, the iodine always constitutes the image produced from the dark matter which is absorbed in the first place.

20. Iodine vapor is fixed to darks produced on paper with thick ink, diluted ink unmixed with gum, plumbago, and charcoal in preference to whites; there is also the same relative effect produced between ebony wood and white wood, dark silk and white silk, and finally the dark parts of white feathers and the dark parts of the magpie and plover with regard to the white parts of these same feathers.

To be Continued.

ON ACIDS. I.—VEGETABLE ACIDS.

IN common language, the word *acid* signifies any substance possessing sourness; in chemical, any electro-negative compound capable of combining with bases to form salts.

"The chemical history of the acids is still undecided, and the laws which regulate their combination with the bases, as well as the precise nature of the resulting salts are involved in considerable obscurity. Lavoisier, and the associated French chemists, conceived that acidity resulted from the union of a peculiar combustible base, called a radical, with a common principle of acidification called oxygen. The inaccuracy of this hasty generalization was disproved by Bertholdt, who maintained that it was carrying the limits of analogy too far to presume that all acidity arises from oxygen. The early opinion of Sir Humphrey Davy, afterwards revised and modified by Murray, was, that intimately combined water was the 'acidifying principle.'

"In 1810, however, this celebrated chemist published a series of dissertations, in the Philosophical Transactions, which fully overthrow the hypothesis of Lavoisier. It was soon established that both hydrogen and oxygen were capable of producing acids, of which the sulphuric and muriatic acids may be taken as examples. It is now generally acknowledged that no *one* substance or element can be regarded as the general '*acidifying principle.*' The more recent theory of the acids, elaborated out of the researches of Graham, Liebig, Dumas, Clark, Fremy, Thelow, Dulong, Peligot and others, is affirmed by its supporters, to establish the views first established by Sir H. Davy, respecting the chloric and iodic acids and their salts. In this scheme, all the acids are united into one series, and all the salts into another, both being so closely connected, that it is said, 'that these two series may be considered as one.'

"The existence of hydrogen in the oxygen acids, in the free or active state, is here deemed an essential part of their constitution, and thus the name of hydracids has been given them. This principle has been extended to *all* the acids, even the organic. Those acids that contain one equivalent of hydrogen, are called monobasic; with two eq., bibasic; with three eq, tribasic, and so on; the general term of polybasic being applied to those which combine with

two or more equivalents of hydrogen. The muriatic may be taken as a type of the first; the tartaric that of the second; and the citric that of the third. This view of the acids presents the advantage of simplicity and unity of classification

"In the union of the acids with the bases forming salts, it presumes that the hydrogen of the acid is replaced by the base, it having previously played the part of a base itself. Consequently acids may be viewed as the hydrogen salts of their radicals, and acids and salts, with regard to their constitution, form but one class. 'The neutralizing power of an acid depends entirely upon the number of equivalents of hydrogen replaceable by the bases.' Other hypothesis have arisen respecting the acids, but have possessed little merit and obtained little notoriety.

"The acids have been variously classed by different writers, as into *organic* and *inorganic; metallic* and *non-metallic; oxygen acids* and *hydrogen acids*, and *acids destitute of either of these elements;* the names being applied according to the kingdom of nature, or class of bodies to which the radical belonged, or after the element which was presumed to be the acidifying principle.

"The names of the acids end either in *ic* or *ous;* the former being given to that containing the larger portion of the electro-negative element, or oxygen, and the latter to that containing the smaller quantity. As sulphur*ic* acid, an acid of sulphur; sulphur*ous* acid, another sulphur acid, containing only two atoms of oxygen. When a base forms more than two acid compounds with oxygen, the Greek preposition *hypo* is added to that containing the smaller portion, as hyposulphuric and hyposulphurous acids. This system of nomenclature was originally adopted under the idea that *all* acids contained oxygen, but the same terms are now applied, regardless of the acidifying principle, as hydrochloric acid, hydrofluoric acid, &c. The prepositions *per*, *hyper*, and the sylable *oxy*, are also prefixed to the names of acids, when it is intended to denote an *increase* of oxygen, as hypernitrous acid, perchloric acid, oxymuriatic acid, &c."

All strong liquid acids should be kept in glass bottles, with perfectly tight ground glass stoppers, except hydrofluoric acid, which must be kept in lead bottles, as it acts strongly upon glass. Glass vessels should also be used in measuring them.

Pure vegetable acids are said to possess the following characters; they cause vegetable blues to change to red, and are nearly all crystallizable; soluble in water—and many of them in alcohol also—they are colorless and heavier than water.

Acetic Acid.—This acid is found naturally prepared in the sap of many plants, but for general use it is obtained by fermentation; it is composed of four parts carbon, three parts oxygen, and two parts hydrogen. The acetic acid of commerce is obtained from vinegar, of which there exists four varieties, known as *malt vinegar*, *wine vinegar, sugar vinegar*, and *wood vinegar.* The first three are made by the acetous fermentation which converts the alcohol of these substances into acetic acid by the absorption of oxygen; the last by the destructive distillation of wood in iron retorts.

"There are three different processes employed for the manufacture of pure concentrated acetic acid, viz: I. *The decomposition of dry acetate by oil of vitriol;* II. *The decomposition of the acetate of copper or lead by dry distillation;* and III. *The decomposition of the acetate of lead by sulphate of iron or soda, in the dry way.*

I. *By decomposing the acetate of sulphuric acid.*

1. Mix 9 oz. sulphuric acid in 9 oz. of water and pour it on two pounds of acetate of soda, previously placed in a glass retort. This should be distilled in a hot sand bath, being careful not to increase the heat towards the end of the process. This acid crystallizes at 28° F. and even at 45° if an acid crystal is dropped into it.

2d. Put three parts of acetate of soda, finely powdered and thoroughly dried into a large retort, and pour upon it 9.7 parts pure sulphuric acid. "Sufficient heat will be evolved by the reaction of the ingredients to cause 1-8 of the acetic acid to pass over without a fire; heat must then be applied, until the mass in the retort becomes quite liquid. Rectify the product, when two parts of pure acid will be obtained, containing only 20 per cent of water. The latter portion which comes over, exposed in a close vessel to a temperature

below 40° F., deposites crystals of hydrated acetic acid. The weaker or liquid portion being poured off, the crystals may be again melted and crystallized by cooling. The crystals of the last operation, separated from the liquid are perfectly pure."

These two processes are easily performed, and are quite sufficient for our purpose. An excellent acetic acid, however, may be readily formed by soaking charcoal, perfectly dry, in common vinegar, and then distilling it. The water comes over first and then the acid.

"Pure glacial acetic acid is liquid above 60°, but below that temperature forms brilliant, colorless, transparent scales and tubular crystals. It possesses a powerful odor and acid taste, dissolves camphor and resins, and mixes with alcohol, ether, essential oils, and water. In its pure state it is a corrosive and acrid poison. It unites with the basis, forming salts called acetates. It should be kept in stoppered glass bottles."

"Acetic acid or vinegar is frequently adulterated with oil of vitrol, nitric or muriatic acids as well as various other acrid substances, for the purpose of giving it a spurious acidity. It also frequently contains copper, which it derives from the vessels in which it has been kept or measured."

Its purity may be tested by either of the following substances.

A small quantity of peroxide of lead yields a white precipitate when oil of vitriol is present.

Muriatic acid added to acetic acid previously boiled with a little silver leaf throws down a white curdy powder, which is soluble in ammonia.

A dilute solution of nitrate of silver also precipitates a curdy white powder if muriatic acid is present.

Lead may be detected by a weak solution of iodide of potassium which gives a yellow precipitate.

Sulphuretted hydrogen gas or water gives a blue precipitate when copper is present.

Malic Acid.—This acid is found in the apple, but may be prepared by adding to the diluted juice of the berries of the mountain ash, while hot, a solution of the acetate of lead, as long as the mixture is rendered turbid. Filter while hot. On cooling the malate of lead crystallizes, to which must be added dilute sulphuric acid, in quantity not sufficient to decompose the whole of the salt; the remaining part of the lead is separated by sulphuretted hydrogen gas, and the solution filtered to dryness.

It may also be prepared by adding to one part of sugar by weght, three parts nitric acid, filtering and evaporating by a water bath until crystals form.

This acid contains 3 parts of carbon, 4 of oxygen and 10 of hydrogen. It is of weak powers, does not remain in a crystallized state, is generally of a brown color, reddens litmus paper, is soluble in alcohol, and can, by the action of nitric acid be converted into oxalic acid.

Oxalic Acid—Is composed of two parts of carbon and three of oxygen. It is formed abundantly in the oxalis acetocella, has a strong acid taste and re-action. It crystallizes in long transparent, colorless, quadrillateral crystals, which contain four parts of water, and are soluble in twice their weight of water at common temperatures. It does not dissolve readily in alcohol, and precipitates lime from its neutral solutions. It may be prepared by the action of nitric acid upon sugar, using five parts of the former diluted with ten parts of water, to one of sugar, which must be digested by a gentle heat as long as gaseous products are colored; then evaporate and crystallize; dry the crystals, re-dissolve and again crystallize.

Oxalic acid is a verulent poison when taken into the stomach in large quantities. Its effects may be avoided by an emetic, or by taking chalk, or magnesia mixed in water.

Benzoic Acid—Is composed of 15 parts carbon, 3 of oxygen and 6 of hydrogen. It exists ready formed as a constituent of all the balsams, and is obtained by sublimation and other means from the gum benzoin of commerce. When pure, it possesses no odor, is solid, of a white color and acid reaction. It has a bitter taste, and crystallizes in long white glassy prisms. When heated in close vessels, it fuses, part suffering decomposition. It is soluble in 25 parts of boling and 200 of cold water, and in two of alcohol. It is not acted upon by nitric, sulphuric or muriatic acids.

It may be prepared by putting a quantity of gum benzoin into an earthen crucible, or other convenient vessel and applying heat. When fumes of heat begin to arise place a cone of paper over the mouth of the vessel, in which the benzoin will condense and crystallize. It must be deprived of its color, which is owing to an empyreumatic oil formed by the destruction of the balsam.

It may also be prepared by boiling the balsam, after pulverising it, in water, containing potash or ammonia, filtering and adding dilute sulphuric acid as long as a precipitate falls, filtering again and subliming. The product of this process is generally great r that by the first, and, consequently, it is most usually adopted. The best benzoin should always be used as a matter of economy.

(TO BE CONTINUED.)

From the London Art-Journal.

OBITUARY.*

MR. J. M. W. TURNER, R. A.

BUT in contending for the fidelity of treatment, as regards their natural philosophy, exhibited by Turner in his landscapes, we must perhaps exclude those of the last twenty years, more especially, from that of positive actuality; in fact, many of his professed "views" are only types of realities; his Venetian and other Italian scenes are more places of his own creation than existing localites. Italy was the land over which his imagination revelled; it gave him ideas to mould into whatever form, and to invest with whatever color, his genius might choose to impart to it; he saw beauty in her palaces, and grandeur in her ruins of departed greatness, and he invested them with a glory which might have belonged to their primitive state, and which is due to them, how low so ver they may now have fallen. He revivified Italy, making her not what she is, but what it may be supposed she might have been when holding an exalted position among the nations of the earth; but he put his peculiar stamp of beauty both on the present and the past. The fact is, Turner's mind was too poetically constituted to permit him to treat even the most commonplace theme in a common way; his faculty of conception was too expansive, his power of invention and creation too fertile, and his taste too refined to permit him to become a mere imitator of Nature; the pencil of the artist is like the pen of the poet, and we seem to be reading an epic when studying one of his pictures. Look, for example, at that of "The Old Téméraire," exhibited at the Royal Academy a few years since, and engraved by Willmore in the "Royal Gems of British Art;" a picture that tells its story in a manner no poet could surpass in descriptive verse.

The works of Turner indicate three distinct periods of his practice; the first shows the closest attention to the most minute detail of nature, and a sober unaffected application of color; having made himself perfect master of these qualities, he launched out into a bolder and broader use of his pencil, still adhering closely to form, and using the colors of his palette with amazing force and richness; in his third, or last period, he seems to have neglected form almost entirely, and made color the only exponent of his ideas. The second class of works are those to which, unquestionably, the highest value will be attached; they will alone, we suspect, bear the test of time.

We believe that nothing herein stated will be found opposed to our previously expressed opinions; when forced to write in terms of deep regret at what we considered the erratic course of his genius we

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* Continued from page 252, Vol. 3, No. 4.

always rendered homage to its marvellous doings—marvellous even in their very vagueness and wanderings—still more wondrous when confined within reason: at all times, however, something of truth and excellence is to be found in his falsities. It is no new thing for genius to be eccentric, even in what it most loves; and perhaps had Turner been less violently opposed, he would not have so defied public opinion, even for his own sake. His was a mind not to be written down, while his love for notoriety, for he was undoubtedly often impelled by this weakness, might have urged him to pursue a course which kept his name constantly before the public. Perhaps he was unwise to have so acted; he could not thereby add to his real fame, and most certainly his pertinacity has ended in diminishing it.

The pages of the *Art Journal* are not the place for repeating the idle gossip respecting Mr. Turner's private life, and mode of living; we have to write of the artist, and not of the man, and whatever may be laid to his charge, we have no desire

"To draw his frailties from their dread abode."

There is no doubt he lived in a style utterly below his high position and his acknowledged wealth; there are hundreds who do the like, against whom the finger of scorn is never pointed; and what, after all, can his detractors say, when it is known that he accumulated riches, not as a miser does for the pleasure of counting his gold, but for a noble and Christian-like object? If he preferred solitude to society, and hoarded his gains—not ill-gotten, but the fruits of arduous labors—denying himself the social comforts of life the end he purposed justifies the means he adopted to bring it to pass. Professional men do not make money rapidly and largely like the speculative merchant and thriving trader, but only by slow degrees and by thrifty habits. Turner, it is said would demur to the overcharge of sixpence; and Guy, the founder of the hospital that bears his name, would put out his dim rushlight if a friend called in to have an hour's conversation in the evening, saying "they could talk as well in the dark as in the light;" and yet thousands have since pronounced a blessing on his name; many will hereafter do the same by Turner's. There are various motives which actuate men to deeds of charity; some like to have their benevolence the theme of admiration; others prefer to see the happiness it gives; and others, again, are contented to know that the good they do lives after them: but all have a claim to the esteem of their fellow men, whatever impulse they follow, so long as it works beneficially. Turner has left to the nation the whole of his *finished* pictures, the number of which is not yet exactly known, but they comprise many of his noblest productions, on the express condition that a suitable gallery be erected for their reception within ten years. Of course so long a period will not be allowed to elapse ere this be done; in the mean time arrangements will be made by Mr. Turner's executors, and by his express directions, that the public shall have an opportunity of seeing them, at his late residence in Queen Anne-street, as soon as they are ready for exhibition; this will not improbably be during the ensuing season. His funded property, and whatever may be added thereto by the sale of his vast collection of unfinished pictures, drawings, sketches, &c., is, with the exception of a few legacies, to be devoted to the erection of an asylum for decayed and destitute artists, without, we believe, any limitation as to the department of Art each one may have followed. Here is a result arising from a diligent, active, and laborious professional career, which has but few counterparts. There is no doubt that to effect such an object was the grand aim of Turner's life, and that for this purpose he denied himself what most men would consider its chief joys. Therefore let such a life be "measured by its worth," and who would presume to limit its value?

Mr. Turner died on the 19th of December, at a small lodging he had occupied for some time at Chelsea, though his residence for many years was in Queen Anne-street, Cavendish-square, of which he held possession at his death. A very short time before he breathed his last, his attendants, believing him to be still in a state of consciousness, placed him in such a position that he might catch a glimpse of the sun, which was then shining gloriously through the windows of his apartment, thinking that a sight of the orb he had so often studied in its various aspects, might rouse him

to observation; but the windows of his mind and his sensual vision were alike darkened, so that he neither saw nor understood. He was buried on the 30th of December, by his own desire, in the crypt of St. Paul's Cathedral, by the side of Sir Joshua Reynolds whose genius he idolized Here also repose others of our distinguished artists; the presidents West and Lawrance, Barry, Fuseli, and Opie; but among the illustrious dead now resting beneath that noble pile, no name will be more venerated by the lover of Art than his whose ashes were last deposited there. Mr. Turner's funeral was attended by the president of the Royal Academy, and upwards of twenty Academicians; many of the Associates were also there, but not by invitation, as it was found absolutely necessary to limit the number of invitations, in consequence of the very numerous applications made to the executors from individuals of all ranks anxious to testify their respect for this great master of art. Several of his patrons and personal friends were present.—Mr. Windus, Mr. Griffith, of Norwood (one of his executors), Col. Thwaites, of the National Gallery, Rev. W. Kingsley, &c.

We have considerably abbreviated our own observations for the purpose of affording space for some critical remarks on the style and character of Mr. Turner's works from the pen of Mr. John Burnet, the eminent engraver, and author of the "Life of Rembrandt," &c. &c.; which, we are sure, will be read with interest.

To form a proper opinion of Turner's position as an artist, we ought to call attention to the state of the arts (particularly water-color drawing) at the period of his commencement; unfortunately there is no public collection by which the subject could be illustrated, without which it becomes a mere catalogue of names; but the affinity is no less striking than the works of Shakspeare are to those of his contemporaries. Turner's earliest drawings are like Hearn's, his Italian scenery resembles the works of Cousin's, while those of a later period vie with Girtin in force and breadth of effect; indeed, he frequently worked in conjunction with Girtin, at the house of Dr. Munro, in the Adelphi. We are not aware that there exist any paintings in oil of this talented young man, who, though ending an irregular life at the early age of twenty-seven, lived long enough to change the style of water-color subjects from mere topographical views to combinations of composition, and effective light and shade. It is observable that notwithstanding the paintings of Reynolds, Gainsborough, and Loutherbourgh, the same predominance of color in drawings of that period is not carried out; hence we see those of Farrington, Paul Sandby, and others, deficient in this respect. Not from any want of richness in the materials, for we find after Turner commenced painting in oil, that his drawings gradually left their sole dependence upon light and shade, for the more captivating charms of color; so much are artists and others guided by what is the practice of their contemporaries. No sooner, however, were the capabilities of water-color disclosed, than its advantages are exemplified in the drawings of Barrett, Havill, and Bonington, down to the present day. The competition between oil and water-color painters, led to the adoption of size color by many artists, particularly by Cousins; the paper was also made of a thick substance, and kept wet during the progress of the drawing. This gives to many of Girtin's drawings a rich, solid, appearance; many made use of a paper manufactured with a rough surface, which gives a texture to the drawing conveying the rude appearance of nature; and paper is now made not only rough, but very absorbent, especially sketching, and some of our best draughtsmen, such as Hunt, use a pen-knife to scrape up the lighter portions of the tints, more effectually to render the drawing a complete imitation of the luminous quality inherent in nature's works. The early drawings of Turner, though possessing little to indicate his future greatness, nevertheless contain the elements of perspective, and architectural correctness; a command of the pencil, which he retained to the last, seldom using a maul stick. Though Gainsborough, Wilson, and Loutherbourgh made few drawings in water-color, yet their paintings influenced those of the rising artists, particularly Turner; from the first two, he learned the distribution of warm and cold color; the noble masses of the shadow he acquired principally from Wilson; witness their pictures

in the National Gallery, and the magnificent sea pieces, of Loutherbourgh in the painted Hall of Greenwich Hospital The early drawings of Turner gradually assumed a grandeur from the contemplation of the pictures of these artists; and his first oil picture, now in the possession of Mr. Hering, the surgeon, shows a decided emanation from Loutherbourgh and Wilson. The pictures of Claude were scarce in England at this time, but the matchless engravings by Woollett were the admiration of the public; to Claud Lorraine, Turner was indebted for many of his finest qualities of composition and color.

The early compositions of Turner are of a simpler character, and contain fewer parts than his later works; this not only arises from his being engaged in representations of extensive scenery, such as the embellishment of engraved subjects demanded, where a multitude of objects was required to be given in a small space, but his changing his conduct of light and shade from a breadth of shadow to a breadth of light, which gradually expanded to almost a want of solidity in his last paintings; this was also the reason for adopting a more brilliant style of color, for objects to be rendered sufficiently distinct, without cutting up the breadth of light, could only be produced by the contact of hot and cold color In these pictures he more resembles Wilson and Claude than in his latter pieces, both on account of the largeness of forms, and his breadth of shadow. We seldom find his compositions similar to those of Ruysdael or Hobbima, or even Gaspar Pouissin; the grouping of his broken ground and trees is sometimes like Rubens, both in the perspective lines, and the distribution of his hot and cold color. Cuyp, in his color and arrangement of composition, was a great favorite, and frequently served as a basis to found a subject upon; amongst others, he spoke highly of the Earl of Ellesmere's picture of "The Canal of Dort." In his lectures on perspective, he instanced not only the assemblage of the lines in repeating the several forms to give richness of effect, but also the unison of the whole breadth of color. In the treatment of particular objects or subjects, embracing individual places, he would give the most essential features both by their situation on the canvas, and by rendering inferior portions subservient to heighten the effect upon the eye; also where lines were disagreeable in form, he either made them disappear in the uniform color of the background, or destroyed their consequence by the repetition of the same shapes in the lights or shades of the sky; this gives greater value to those points which the spectator is most likely to have remembered; and whatever liberties are taken with subordinate portions, the principal features are not only observed, but carefully treated in their light and shade, form and color; and to the local situation of the several views he not only preserves the character of the trees peculiar to the place, but likewise the weeds of flowers indigenious to the spot. Nor was he less careless in choosing the characters of his figures to embellish the several scenes, for even the most trifling incident was pressed into the service that could excite or heighten the association of ideas; this it is that gives an imaginative or poetical stamp to his works In his Italian compositions, the works of Virgil and Ovid were ransacked to people the scenes restored from the remains of ancient Roman architecture. If the sea-ports of England spring from his pencil, the heroes of Nelson, or the songs of Dibdin, rise before the spectator, enlisting his feelings in the scene. It may be said the figures in the landscapes of Nicolo Pouisson, or of Claude, may have suggested the first series, or those in Loutherbourgh's the other class, but although hints may have been presented to his mind, his great genius stamped them as his own. And whatever similarities may be observed in the pictures of other artists, Turner's skies are peculiarly his own; if in topographical scenery, they not only adorn but render interesting the most barren subject; the variety of forms in the clouds, their perspective elongation and diminution; the bursts of sunshine from the azure openings; the rain-charged depositories, emptying their burdens through the prismatic curtains that enshrouded them, tend to embody the immortal poetry of the author of the "Seasons" throughout the varied year.

With these few remarks on the composition of Turner's paintings, necessarily rendered less distinct for want of examples to refer to, we pass on to an examination of his principles of chiaroscuro; one great

test of his excellence in this branch is, that no pictures are translated into black and white of engraving with less deterioration than Turner's. Certainly no artist has been more fortunate in having the command of so great a number of excellent engravers, nor have many prints been published without his supervision and touching; yet, with all these advantages, few pictures denuded of the charm and variety of color, but lose much of their beauty; this arises from the happy combination of the aerial with the lineal perspective, the contrast of the masses of his shadows with those of his lights, and the forms and situation of the various portions of each. The earlier pictures of Turner are his darkest, but even the darkest masses are void of blackness and heaviness; neither do we perceive harshness nor want of softness: if a mass of dark trees is brought up against a light sky, its edges are rounded by portions of trees of a more delicate color, and in accordance with the tone of the adjoining sky, also of a thinner and more leafy character; if the dark of the picture is composed of a building in shadow, delicate grey tones are painted into it, and touches of warm color to prevent its looking heavy. The strongest darks towards the foreground are of a warm hue, as we perceive likewise in the pictures of Wilson and Gainsborough; his strongest dark masses are cleared up and prevented from blackness by a figure or dark object coming against them; if the mass is of a cool tint, he often brings a warm dark in contact, and *vice versa.* Callcott, who often imitated him without being aware of it, has a picture in the Vernon Gallery that gives a very good idea of Turner's dark manner; his pictures of this time have many admirers, who consider there is a greater degree of sublime poetry in them than those of his later period, such as "The Lake of Thun," in Switzerland, "The Seventh Plague," and "Fishing-boats going out to a Wreck." There is certainly a solemnity in the absence of bright and gay color, and a grandeur in a breadth of dull tones; and we question whether "The Old Guard Ship at the Nore," painted upon this principle now in the collection of James Wadmore, Esq., of Upper Clapton, is not more impressive than the picture, in his own gallery, of "The Old Fighting 'Temeraire' towed to her last moorings," where hot and cold color revel in bright opposition. While we are on this subject we will notice his treatment of water, and the great excellence he displays in his sea pieces; looking at the works of Backhuysen, Vandervelde, and even Loutherbourgh we perceive a defined edge to each wave, as if the sea had been instantaneously converted into ice; under the pencil of Turner it assumes the peculiarity of the watery element—motion, the outline of each wave hurrying into oblivion; this may be noticed in comparing the picture of Vandervelde with that of Turner, in the gallery of the Earl of Ellesmere; the smallest incident partakes of this character; Backhuysen, Vandervelde, and others, throw in a piece of board on which to write their names, Turner writes his in the trough of the sea, but in such a style as nature would present every letter flowing into motion, reminding one of the words of Shakspeare, "their good deeds are writ'en in water." This character of agitation he sometimes carried to extreme as in the picture of Lord Yarborough's where fishing-boats are endevoring to save the crew of a wreck; when this picture was exhibited lately at the British Gallery, Admiral Bowles remarked to a friend of ours, that "nothing could exist in such a sea." Turner's feeling was to exemplify the intrepidity of English sailors, and he considered nothing was too dangerous to depict. A strange feature is observable in his treatment of troubled water, that, however multitudinous and broken the waves are represented, they are, nevertheless, congregated to produce magnitude and grandeur by largeness of form and masses of shadow Whatever was the characteristic feature of any circumstance, his mind could comprehend, and the dexterity of his pencil could execute it Thus, his picture of the Eddystone Lighthouse is not a tame topographical representation of the architectural structure in a summer's day, but its beacon light is exhibited glaring up against a dark, stormy sky, with a sea breaking up on its column, that, but for its warning would engulf everything. Hail, rain, or sunshine, were made use of as best suited his purpose; in his picture of "Hannibal Crossing the Alps," a bold und rtaking under any circumstances, Turner has not only shown the enemy

throwing down stones, or other missiles, to add to the difficulty, but he has represented the passage under the horrors of a snow storm. Had he painted Buonaparte's retreat from Moscow, he would have realized the scene in all its dreadful appearance: or the burial of Sir John Moore at the "dread of night," his work would have vied with the immortal verse of the ode.

It is in his great conception of a subject, and his mode of treating it, that his genius lies; his breadth of effect and of shadow, his brilliant representation of light, are often to extremities, that make "the ignorant laugh;" but even where he oversteps the modesty of nature, his pictures possess a redeeming quality in the boundless expanse of space. In the distribution of his lights, however scattered and disjointed they may appear to the eye of a common observer, to skillful investigation they exhibit a magical unity of purpose, like the followers of Lochiel, in Campbell's poem,

> "Their spears are a thousand, their bosoms are one."

This arrangement in the conduct of his picture always tends to simplicity; if sunshine, he contrives the shadows shall fall in the same direction with the lines of his buildings, by placing the point of sight in or near the sun; this, it may be said, we often find in the works of Claude and Richard Wilson; but in Turner it becomes a matter of no necessity from the multiplicity of objects represented. The diminution of strength of tone, with the diminution of size in the object, is very peculiar to his manner.

Before entering upon the subject of color under the hands of Turner, it may be necessary to make a few remarks upon his change of style, from a dark to a lighter manner. Callcott, who was supposed to follow our great master in the treatment of his subjects, was taken up to a picture of Turner's in the Exhibition of the Royal Academy by Sir George Beaumont, supposing it was from his own pencil: "Now," said the amateur artist, "they cannot accuse you of imitating Turner any longer." "Why," replied our late amiable friend, "that picture is Turner's." We mention this to show the fallacy of the public opinion, in imagining that Turner was possessed of a Proteus power; his style was founded on the soundest principles of Art, on which dark or light subjects must be conducted. The works of Callcott and Turner exemplify the old adage, that there is nothing new: nor is it, especially in Art, to be wondered at. A perpendicular line must be so, and a horizontal one similar, to the end of time: so also, must be hot and cold color; their distribution and situation have been adopted by those artists whose pictures exemplify the treatment. Lawrence said shadows ought to be cool, and the lights hot; Turner, on the other hand, insisted that the shadows ought to be hot, and the lights cool. The public imagine from these contradictory statements that there are no fixed principles in Art—it is an ignorant delusion. To the initiated, a picture is like a printed book: amongst all the excellencies of Turner, perhaps, there are none more remarkable than the treatment of the landscape, and buildings with the sky, the outlines of which, if faulty, were swallowed up in the lights and shades of the sky; if beautiful, everything was sacrificed to their predominance. What is termed the sky line has been a stumbling block to thousands, and without examples it is difficult to explain. Soon after writing these remarks we passed over Hungerford bridge, just as the sun was setting behind Sir Robert Peel's house. The buildings of the new House of Parliament, jutting out from the general mass, conveyed the finest specimens to be seen in London; and we feel happy to give this tribute to the genius of Barry, whose plan was to embrace Westminster Abbey, the Hall &c. in one general group. If Turner had been engaged to paint a picture of this scene, this is likely the spot he would have chosen, and would have said so, as his great rival in English scenery, Richard Wilson, remarked, "If you want a view of St. Paul's take it from Blackfriars Bridge."

Fuseli used to say that it would be easy to give breadth of flatness, and insipidity could give it, but Turner was never guilty of such subterfuges; the lightest of his pictures have always a redeeming quality in them, the dark touches are small, which, giving solidity to the effect, never interfere with the breadth of light. We have mentioned the excellent treatment observable in the skies of Turner, compared with those of Claude; they are far more

brilliant, but there is a depth and unity in Claude of a very high quality, and if their works were hung together, they would damage each other. In the seaports of Claude the setting sun is always predominant, the surrounding tints of the sky and adjoining buildings are kept of a dull flat tone, which are rendered aerial by the deep dark blue in the base of the picture. The figures and other subjects are more generally in red dresses, or warm tints of color. Turner adopts the same treatment, but in a more vivid and powerful manner. His clouds are more agitated, and what may be observed in the exhibition of them, when fresh from the cases their light edges were bright. They are now changed in this particular, but still are faultless from the general forms being of a good shape. This color was always founded upon the basis of chiaroscuro; hence the change into black and white of engravings is less injurious to the effect than in the works of other artists. The most retiring parts of his distance, if cool, are heightened by a strong red being brought in contact in the foreground, and his near shadows being filled with strong warm color, are effective in black and white from its being in the right place. The pictures of Turner have a harmonious character, not only from their being painted on a white ground, but from many of them being commenced in water color; hence his works have a strong resemblance to fresco painting. This unfortunately makes the oil portion liable to crack and peel off the canvas. His later works have much less oil in the vehicle than his earlier, which adds to the luminous character, by throwing off the light which oily substances absorb. This may be observed by looking at his pictures in twilight.

It is worthy of observation to perceive pictures under the Daguerreotype process; warm yellow and red colors give out less light than blue and cool tints. With these few critical remarks we must conclude. Turner has given a greater separation between modern pictures, and the old masters; this distinctive feature will decline as his colors fade, but the poetical imagery of his magical combinations will increase as his pictures become more known. One more remark and we have done. Turner has translated the principles of the old masters into a more captivating style. They cannot be read or deciphered, but they have attracted more attention from the vivacity of the translation.

OF OBJECT-GLASSES.

Translated from the French of N. P. Lerebours, by Mrs. Anna L. Snelling.

WE know that all combination of several glasses, the effect of which is to converge the rays of light passing through them as well as those of convex lenses—whether they be made of crown or flint glass, white or colorel, when placed opposite to a luminous object have the property of forming on the opposite side, at a greater or less distance, a reversed image of that object, almost always smaller than the object itself.

We understand by the axis of a lens, that mathematical line which joins the two centres of curvature of the two surfaces. If the object—the sun for instance —is situated beyond and opposite one of these centres, it throws parallel rays upon the lens, which, passing through, forms an image upon the axis at a point which is called the principal focus.

The distance of the focus from the lens is called the focal distance. In the case in question the size of the image is 1 103 of the principal focal distance. If the object is at a great terrestrial distance, the image

is formed a little farther from the object-glass, but very near the principal focus. If the object is placed nearer the lens the image is formed farther off and consequently reduced in size, and the nearer the object is placed the smaller the image will be until it reaches double the principal focal distance; the image is then of the same size and at the same distance as the object. Then when the object is placed between the principal focal distance and double that distance, the image is formed between the double focal distance and infinite space; the image being much enlarged as the object approaches nearer the focus; the character of the object being inverted in the image.

When the object is precisely at the principal focal distance there is no longer an image formed in consequence of the refracted rays being parallel with the lens; and, again, if it is situated between the principal focal distance and the lens we can no longer have an image as the rays are divergent. These principles established, it is easy for the photographer, who understands the focus of his object glass, to determine with considerable exactness at what distance he ought to place his camera in order to produce an image of the dimensions desired; for knowing the focal distance of his lens he will call to mind that in order to be able to produce the image naturally he should place it at double the distance from the principal focus. If we suppose this distance about one yard, the object will be placed at two yards and the image will be formed at two yards of the same dimensions as the object. The observer will remember that the nearer the object is to the lens, the larger is the image, so that its size is to that of the object as its distance from the object-glass is to the distance of the object from the lens. In other words, if the focus of the object-glass is of two inches, the object will be situated at twice that distance, or four inches, and the image produced at four inches will be of the same size as the object. If the object is placed at five inches or two and a half times the distance of the focal image, the image received will be two-thirds. If it be at six inches or thrice the focal distance, the image will be half; if it is at eight inches or four times the focus, it will be two thirds; if it is at ten inches or five times the focus, it will be one quarter, &c. It is evident after the preceding examples, that the denominator of the fraction which expresses the dimension of the image, is equal to the number which indicates how many times, less one, the focus is comprised in the distance between the object and the lens. The photographer will remember that the larger the object the less luminous will be the image; and, consequently, require a greater length of exposition. If he calls to mind that among several object-glasses of the *same construction*, that which has the shortest focus, ought to be the most rapid, and sustain the greatest angle. Thus the *medium* object-glass, used in the portraits of M. Gaudin, which have only eight centimetres of focus, sustain an angle of 48 degrees. The normal object-glass of M. Daguerre, sustains about 27 degrees; and an object-glass of 80 or 90 centimetres of focus cannot embrace a field as extensive as the others. The operator is then prevented from producing the whole of a monument. The longer the object-glass, the greater difficulty there will be in obtaining the monument complete.

The preceding principals, are not only necessary, to determine the dimensions which ought to be given to the black camera, but in the following we propose to show how we can produce views, some details of architecture, and of very small objects, such as medals, or insects which ought to be more or less amplified.

We ought then to make known to the photographer, the utility of the diaphrams. These slight disks pierced in the centre, are necessary to arrest the more oblique rays and prevent the diffuse light from penetrating into the black camera. In the preparation employed to produce views of landscapes, that is to say, in all the black cameras composed of a single achromatic lens, the diaphrams are indispensible. The distance which separates them from the object-glass, and their aperture are accordingly established by certain rules.*

* The proportions established by Daguerre and followed by almost all the opticians is this: The diaphram is placed at an equal distance of 1-7 of the focal distance of the object-glass, and its aperture is 1-16 of that focal distance.

These details, and a part of the preceding ones, are to be found in a work upon the daguerreotype, published by M. Buron in 1842.

The operators would then do wrong to increase the aperture of the diaphram and to change its distance from the object-glass. Apart from the slowness which results from a smaller aperture, the image will be more distinct. We can then limit the aperature of the diaphram only as the angles of the polished plate begin to be obscured. This will be the proof that it has obtained its minimum.

What we have then said of the diaphrams for the black cameras furnished with only one object-glass, cannot apply to the object-glasses of twice or thrice the size; those being generally destined for portraits, and being operated very quickly, are almost always used without the diaphram.

The object-glasses, although they are single, double, or threble, ought to have a diameter in conformity with their focus. All these things should be in accordance with the following principles. That which has the longest focus, ought to have the greatest diameter. The diameter of the object-glasses for views—that is those formed by an achromatic lens—is about $\frac{1}{6}$ of their focal distance. The image is then enlarged one half. If only one object-glass is chosen it is easy for every one to measure the focal distance; but, if the question is to determine the focus of a series composed of several glasses, the constructions of the several opticians differ so among themselves that it is impossible to give a proportion between their diameter and their focus.

We are not permitted to contest the superiority of the object-glasses combined over a single chromatic object-glass, with which we wish to operate rapidly, the combination permitting less aberration than we should have in one object-glass of an equivalent focus. But for views and monuments no construction is superior to a good achromatic object-glass. The best proofs obtained by M. M. Le Gray, Mestral, Martens and others give proof of this opinion.

Notwithstanding our desire to avoid all polemics in regard to the *variation* of the two foci in the object-glasses, we commence by saying that the phenomena is incontestible, but we maintain that the practice of it is neglected in Paris.

The conclusions and numerous experiments that we have made with divers polarised apparatus since the 22d of June last, relative to the non-influence of the polarisation upon the variation of the foci, and upon the rapidity of the object-glasses, imposes upon us the duty of affirming, notwithstanding the authority of name, and the friendship I bear to M. Claudet, that we have not changed our opinion upon the subject.

As to the question whether the object-glasses with two foci ought to be preferred to those which have only one, we can only say to the photographers: Compare and choose.

OF THE LIGHT OF THE OBJECT-GLASSES.

The operators are, in general, disposed to find defects in the glasses: Without doubt there have been a great number of bad object-glasses. One, although constructed of the best materials, because the curvatures are bad, and that the chromatic aberrations of the spherocity are not correct. Of others, because the glasses are badly worked, and because they are badly curved. Besides these defects, which are only appreciated after several trials of the comparative examinations, there are others which at first sight they can accept or refuse. We have said that the achromatic object-glasses, are composed of two materials—the crown-glass and the flint glass. These materials are more or less colored, but the different tints are not equally detrimental. First for the object-glasses necessary to take views, the shade is not to be considered, for then it is indifferent whether it remain some seconds more or less, in order to make an impression.* But it is not the same in the case of object-glasses for portraits. All dark or smoked tints, yellow or greenish tints more or less retard the operation. The object-glass placed upon a white paper, ought very slightly to alter the whiteness of the paper. The blue tint alone can be tolerated for it does not sensibly retard the photogenic action.

M. M. Feil Guinard, Clement and Maes, manufacture in France of the or-

* We cannot agree with M. Lerebours on this point, and we account for the great superiority of the German cameras over the French in their lenses being perfectly achromatic, *i. e.* without color.—*Ed. Pho. Art-Journal.*

dinary dimensions, very good glasses for the use of opticians. For larger or smaller dimensions, these glasses leave nothing to desire. The great disks of flint and of crown-glass, almost always contain some defect, and M. Oberhauser has assured himself that the most part of these material regarded as fine contains a number of grains of silica, visible only through the microscope, which gives an enormous blackness to the effect of the object-glasses often a millimetre in diameter! The object-glasses ought then to be made of flint and crown glass manufactured expressly for opticians, after the method of Guinard. The new crown glass with the base of the zinc of M. Maes, without having any marked superiority, has the advantage of being very white. The rough glass being infinitely better worked, some opticians employ it to make convex glasses. When the plate has been chosen with the greatest care, this may be well, but if, besides a slightly greenish tint, we distinctly perceive in an object-glass extremely fine parallel lines, we can be assured that the injury to clearness of the image and to the object-glass ought to cause it to be rejected. These productions are considered with reason to be injurious, but they are according to nature. The most injurious are those which, reunited in number form a kind of whirle which often occupies one or more centimetres of extent. This defect exists most generally in the flint glass, but it can be found in the crown glass ; all object-glasses which have any imperfection ought not to be accepted, but we strangely deceive ourselves in supposing that an incomplete production can alter the quality of the object-glass. We now speak of the blisters found upon some glasses. There are a great number of these. They are very prejudicial—at least to the good appearance of the object-glass. Innumerable specks formed by little bubbles of air, proving that they are formed by innumerable grains of sileca, are more injurious than two or three isolated bubbles, as they are much stronger. We can support our opinion by mentioning a large number of astronomical telescopes, made at a period when the material for optical instruments was very rare, which have cost some millions of francs, and have the merited reputation of being perfect, and which are entirely free from these bubbles of air.

An essential condition in a daguerreotype object-glass, and which is not so much for the object-glasses of the astronomical instruments, is that the polish of the surfaces is very bright, and exempt from what the opticians call the grey of polish. Several materials have the inconvenience of being covered with a humid coating.

The object-glasses which have this defect ought to be often wiped. A piece of woolen cloth and very finely powdered rouge will clean them effectually.

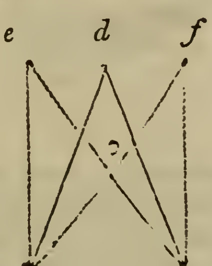
A fine linen, or a buck skin are the best to use. If the rouge has been of long standing, we might add some drops of the spirits of wine. The two glasses which form the object-glasses for views, being almost always united by a cement, it is sufficient to wipe the two exterior surfaces. As to those not sized, joined by a spring-box, it is not often necessary to clean the surfaces, only when you commence operating be careful not to disarrange the glasses, for if that takes place the optical effect will be entirely destroyed. You must be careful in replacing it, that it be perfectly curved. If the glasses have any defect, it will be necessary to resort to the manufacturer.

From the Illustrated London News.

THE STEREOSCOPE.

THE Stereoscope must rank amongst the most interesting and most marvellous of modern discoveries. With the aid of this instrument we now possess the means of transmitting to posterity the exact image of all that is physically remarkable in the present day, at least so much as can be appreciated by the sense of vision. The public and your scientific readers especially, are greatly indebted for the elaborate and highly interesting article which appeared in the *Illustrated London News* of January 24, accompanied with a selection of ingeniously constructed diagrams, by which the wonders of this discovery of binocular vision may be at once experienced and appreciated: but they who have not yet had an opportunity of witnessing the effect of photographic pictures in the Stereoscope can form only a small idea of the amount of astonishment they have yet to experience. When Daguerreotype portraits are first seen with the Stereoscope a feeling of regret is common to all, that this discovery does not date from a more distant time. What would not be the value of a stereoscope portrait gallery of our greatest historical characters, including Shakspeare, presenting all the life-like character and resembling in every respect the reflection of the human face in a mirror. Unfortunately the examples of past wonders, a sight of which we must now more than ever lament the loss of, are far too numerous; but now we do possess this astonishing power, it behoves us to think of the future, and not allow coming generations to accuse us of a selfish negligence in not leaving to them a legacy which science has placed at our disposal. It is to be hoped that galleries will be formed containing all that is most remarkable in the animate and inanimate world of our own time, and that none of the great and beneficent characters of our day will pass away without leaving the light of their countenances for the admiration and laudable curiosity which real greatness must always create. To the generality of persons it must be inconceivable that the combination of two pictures nearly alike can produce such an extrordinary result, and as the curiosity to know something of the "why and because" of this matter will be felt by all who know nothing of the laws by which the effect of solidity or distance is produced, I may, perhaps, not be trespassing on your valuable space in attempting a popular explanation of *how two perfectly flat pictures produce the effect of solidity.* Like cause produce like effect: hence like effects result from similar causes: consequently, as pictures in the Stereoscope present the appearance of nature, it is reasonable to conclude results so nearly alike are produced by similar means. Before entering directly on the causes which produce the effect of solidity, it will be better to clearly understand the qualities of natural images or pictures in their relation to the organs and sense of vision. When a house or a landscape is looked at, it is found to possess a quality which no copy on a flat surface by the hand of our greatest artists can produce. This is solidity or distance, and the appearance of objects standing immediately behind each other. In using this term solidity, it should be borne in mind that distance is the same thing; since solids are only made up of the relative distances of parts of a single object. To these qualities may be added another, which is the painting on the retina of each eye pictures of the same object, differing slightly in perspective. This last quality is peculiarly the property of natural pictures, and which distinguishes them especially from paintings. Distance or solidity only enables single objects to produce this curious effect, in which we shall see the resemblance in stereoscopic pictures—the latter, indeed, being only an imitation of the former. Another quality in natural pictures is the necessity of converging and diverging the axis of the eyes when regarding different parts of the picture; to this may also be added change of focus. This latter quality is familiar to all who have used a telescope or an opera-glass, and consists of the slight adaptation

of the lenses for different parts of the natural picture. These effects of convergence and divergence of the eyes with focal change are also peculiar to solid objects. It will be readily understood that, as objects are more or less distant, the pupils of the eyes, when regarding them, converge or diverge towards or from each other; objects placed nearly in contact with the end of the nose compel the eyes to converge to the degree of squinting, whilst with distant objects they are nearly parallel.

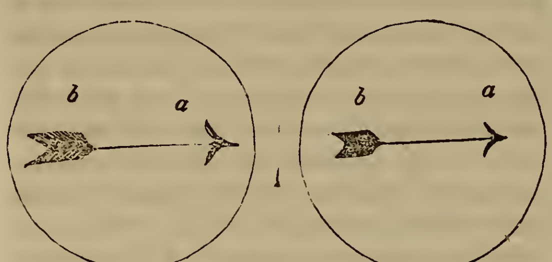


The accompanying Diagram will render this part of the subject quite clear. Suppose three objects in a direct line (*e*, *d*, *f*), and a third similar object in the position *c*: and to the left eye (*a*) the object *f* would be invisible; and to the right eye (*b*) the object *e* would be also invisible, from the intervention of *c*; but *f* is always visible to the right eye, and *e* to the left eye; consequently, with a pair of eyes, these objects are never invisible. This is the simple explanation of the power possessed by two eyes to see round and behind objects. The convergence and divergence of the eyes may be shown by the same Diagram. The eyes, when directed on the object *c*, are more converged than when looking at *d*. In other words, *c* is seen at a much greater angle than *d*; the rays of light proceeding from *c* or *d* compelling the pupils of the eyes to approach or recede from each other. This opening and closing of the visual axis may be fitly compared to the same action in a pair of compasses, and it is by the quantity of this action going on with the eyes that we are enabled to estimate the relative distance of near objects. The eyes, then, may be simply considered as a pair of optical compasses, and the rays of light emanating from the object as the limbs of the compasses. The sensation or effect of distance results from the power which we possess with two eyes to see round and behind objects.

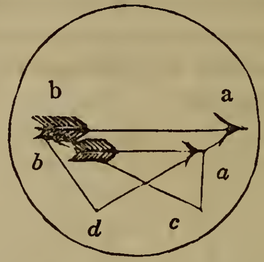
It has been fully explained, in the preceding Diagram, how we are enabled to see distant objects although other objects may intervene; and this is greatly assisted by the necessary change of focus which, while it makes the distant object clear and distinct, at the same time makes the near and intervening object less visible. The quality of focal change becomes of more value and importance in cases where the sight of one eye is lost. It may not be generally known that a person suddenly deprived of the use of one eye estimates with the greatest difficulty the distance of objects. It would be almost impossible to snuff a candle with one eye closed, or even to place the finger exactly on any fixed point. The single eye, like the single leg of a compass, cannot at first measure distance; but after some time, experience teaches the one eye to estimate distance by the change of focus alone, whilst with both eyes we feel and measure distance by the convergence and divergence of the visual axis. The structure of the eye has at all times been quoted as one of the most beautiful illustrations of design and natural mechanism, and certainly the additional discoveries which we may expect to be disclosed by the Stereoscope will not diminish our wonders at the minute and beautiful arrangements by which external pictures are painted on the mirror of the mind. We have, then, arrived to this conclusion, that to experience the effect of distance or solidity, certain circumstances must exist to compel the opening and closing of the visual angle, in proportion as the eyes are directed to different parts of the same picture; but, as in an ordinary single picture, like the painting of a landscape, all parts of it are at the same relative distance from the eyes, it follows that the angle of vision is the same for all parts, and, consequently, the sense or feeling of distance cannot be experienced. It matters not whether we look at the foreground or back-ground, there can be no mistake about its being on a flat surface: it gives rise to no feeling of distance—although the idea of nature may be skillfully represented the most art can do is to imitate the impression of one eye alone. To produce the effect of nature, we must do as nature does: two pictures must be painted, one for each eye, and combined, to

produce the sensation of one. *This is effected by the Stereoscope, the compound image having all the qualities of the natural picture, each part of it compelling the eye to converge and diverge, as it appears more or less distant. This is the most remarkable part of the Stereoscope discovery, that two pictures on a perfectly flat surface when combined should necessitate the same opening and closing of the visual axis as is occasioned by a natural picture where the parts which constitute it are separated by actual measurable space.*

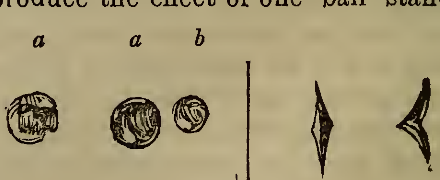
We will now proceed to examine the construction of the compound Stereoscope picture. It has already been explained that it is constituted of two pictures, each taken from a different point of sight corresponding with the two eyes; take, for example, *a*, the simplest form of picture—an arrow standing in a vertical direction through a circle—it would appear to each eye like the Diagram. These two designs



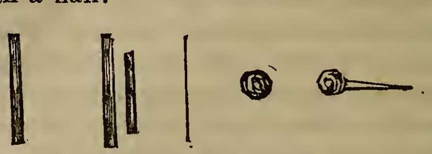
being all that is necessary to produce with the aid of the Stereoscope, the effect of one arrow standing through a single circle with the barbed end uppermost, it now remains to explain how this effect is produced. *It is important to know that in looking at natural objects both eyes are invariably directed or converge on the same point and can only regard a single point at the same time, whilst the Stereoscope enables each eye to look at the corresponding points of two separate pictures. This is indeed the whole secret of this instrument, which by bending the rays of light coming from each picture towards each other, enables each eye to regard a different image at the same time.* In the Diagram of the arrows, *a. a* and *b. b* are corresponding points, the parts *b. b* being separated by a wider space than *a a*; consequently, the eyes being each directed on the parts *b. b* will be wider apart, or will have a greater divergence than when looking at *a. a*; and, as parts of the same object in nature give the effect of greater or less distance in proportion as they cause the eyes to converge and diverge, it follows, according to this law, *b. b* should appear at a greater distance than *a. a*, in other words, the barbed part of the arrow should appear uppermost. The annexed Diagram may



assist the explanation; here the arrows are supposed to be combined, or stand over each other; the eyes (*c d*) being directed on the corresponding points (*a. a*) the visual angle will be represented by *a c d*; and when directed on *b. b*, the angle will be *b c d*; but *b c d* is a much smaller angle than *a c d*; consequently, *a. a* or the barbed part of the arrow must appear the nearest; that such is the fact may be proved by experiment. When this law is understood, the most curious facts may be produced by equally simple means; the addition of a mere dot, or a single line to a diagram will be all that is necessary to make it stand out from the surface on which it is drawn. The following are illustrations of some of the simplest forms of stereoscopic pictures—the first is intended to produce the effect of one ball standing

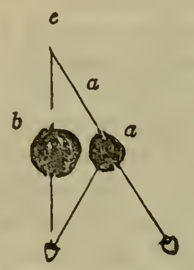


before the other; the second, the effect of the barb of an arrow pointing towards the observer; the third two lines; and the fourth a nail.



An explanation of the construction of the first image will sufice for the remainder. The balls are supposed to

be in a direct line with the left eye; consequently, the left image will be represented by one ball, and the right image by two. This diagram will also serve to show more forcibly how divergence and convergence of the eyes is produced by terreoscopic pictures: the combined pictures of the balls are represented in this diagram. The left eye being in a direct



line, can only see the ball *a*, and remains fixed on this point when the right eye is directed to *b*: a comparison of the angles will at once show that *b* must appear in the background from the increased divergence of the eyes. The singular part of this case is, that only the right eye moves while the left eye is stationary. A mere glance at any geometric stereoscopic pictures will at once show which parts should be in the foreground and which in the background. All that is necessary is to measure the space between corresponding points of both pictures; those which are widest apart will appear behind those parts which are nearer to each other. In this

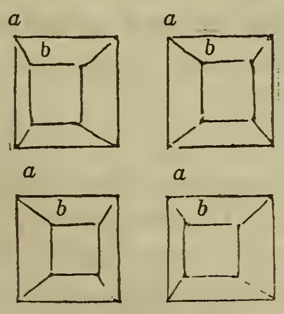


Diagram the pair of pictures produce opposite effects to each other; the parts which stands out in one is behind in the other. The law just mentioned will explain it. In the upper pair *a* is nearer to *a* than *b* is to *b*; hence the part *a* will appear nearest, and *vice versa* in the lower pair of pictures. We cannot, from vision alone, have the idea of distance; it is only when combined with the actual experience of touch or measurement that we can say one part is nearer than another. Nothing can be more subject to deception than vision; as an example, the reflection of a natural picture in a mirror presents all the effects of distance; yet we know from experience every part of this picture is reflected from a plane surface. Again, the recently discovered pseudoscope has the effect of making objects exactly the opposite of what they really are: solids look hollow, objects on the right appear on the left, the more distant objects look the nearest, objects approaching have the effect of receding, &c. A natural picture may, then, simply be considered as a picture containing effects which cannot be rendered on a flat surface; all the ideas associated with it, of distance, &c. are the result of a knowledge or experience which is quite independent of the picture itself, although they assist most materially in giving a character to the impression made on the brain. Color also assist in giving an idea of the form of irregular images, and, in a certain degree may indicate distance by its force or tone. The chief function of color by which is meant light and shade, is to assist in exhibiting the shape of objects when there is an absence of direct lines. A globe is an illustration of this—without light and shade, it would look like a flat circle.

A few words in conclusion on the advancement of photography. The commercial or public application of photographic science in this country has been in a great measure confined to the action of light on metallic plates, although most beautiful effects may be produced on a more convenient and cheaper material, and it is probable that this branch of the subject will be more than ever investigated, since stereoscope pictures on metal, from their weight, cost, and other inconveniences, will not be so largely employed as camera pictures on paper. The public have not yet been able to enjoy the latter advantage, owing in a great measure to the practice of intimidation on the part of certain persons professing to have a legal monopoly of this vast field of photographic discovery. This absurd pretension must soon explode. No individual or number of persons can substantiate a just claim to a field so fertile, and worked by so many laborers. As well might a single man claim a right to the

entire gold diggings of California or Australia. It is to be hoped future progress in the science of photography will not be hindered or obstructed by the narrow-minded conceits of men, whose chief ambition is to hang their names to the original discoveries of true genius; possessing nothing within themselves but a disgraceful love for patented monopolies, and the indulgence of a selfish tyranny, supported by law and money. The Smitbotype, Talbotype, or any other of the human types, may affect to possess a unique claim to all future developments of photography, and may, backed by the lawyer, alarm timid investigators with notices not to trespass or poach on their domains; but we would earnestly recommend a combination amongst the large class of photographists, for the purpose of opposing and exposing this attempt at monopoly. When do we hear of Faraday, Playfair, Wheatstone, Hunt, and other eminent and honorable investigators, hurrying to the patent office for protection and monopoly? The true devotees of science require not the aid of the law and parchment to secure the right of discovery—real merit, like good wine needs no bush. We hope, therefore, in a short time, to be supplied with a collection of sun paintings for the Stereoscope, and with all the consequent improvements, at a fair cost, representing the most remarkable object as well as the most remarkable men in the world.

Stereoscope instruments, with the best construction of lenses are advertised in your columns at a most reasonable rate; it therefore only remains to do away with other pretensions to admit of this wonderful and instructive discovery being enjoyed by all classes.

In the course of this inquiry many matters have been left untouched, through the fear of confusing the subject; the chief object being to show the analogy between the stereoscopic and natural pictures in their relation to the organs and sense of vision. To the scientific man many of the foregoing explanation will appear unnecessarily explicit and tedious; but I trust to the great bulk of your readers, I may have succeeded in making this beautiful and remarkable discovery intelligible; in that case I shall not have failed in proving, in this particular instance, like effect result from like causes.

☞ The following communication meets our views precisely:

Mr H. H. Sneleing—There are two terms used in our art, which, in the progress of improvement, I should like to see entirely abolished. They are the words, "Daguerrean" and "Stock." An artist buying goods enters your store, and says he wishes to purchase stock. The word stock is generally applied to live animals. A lady or gentleman might, with the same propriety, enter Stuart's Dry Good Store or Tiffany, Young and Ellis Jewelry establishment and say they wished to purchase stock. The word Daguerrean, I think, shows very little taste. It is eminently "country" if I may be allowed the expression; you see door-plates, signs, &c. about with H. C. C., Daguerrean, instead of Daguerreotype artist, although I admit that *artist* might, with a great deal of propriety be omitted in some cases, still I think you and others will see my meaning, and it may probably have some effect.

Yours, very truly,

Henry. W. Meade.

THE BROTHERS MEADE AND THE DAGUERREAN ART.

MR. EDITOR: Feeling assured that you like to encourage genius and talent, in every shape—particularly in all that is connected with the Daguerreotype art, allow me, through the pages of your valuable Journal, to give a slight sketch of two brothers, who, for enterprise, activity and energy, well deserve the *meed* of praise.

The writers of biography, have too often been accused of partiality or egotism—it is either fulsome laudation, or wholesale censure. There is no man living so perfect in every particular as to be converted into an angel. Now, what I particularly admire in all the biographical notices given in the Art-Journal, is the perfect *justice* given to each individual. No one is elevated above another. It is not a mere puffing business, nor for the purpose of obtaining notoriety. They are simple statements of facts, showing the improvements in the art—the interest taken in it by different individuals—its progress—its complete success, and the glorious discoveries and improvements continually making to forward the good cause. I was particularly pleased with your sketch of the life of Alston. He is not made to start at once upon the arena of life like Minerva from the head of her father, but we have all his boyish frolics, faults, peculiarities, &c., and we can see the gradual development of the germ which was to grow and strengthen in after years, until men paused in wonder before the master works of the painter poet!

But there is this difference between the painter and the daguerreotypist that the one is more indebted to fancy and imagination, and the other to practical experience for the attainment of success. They both woo shadows, but in a different manner. The shadow formed in the mind or brain of the painter, is made real or substantial, by the exertion of that mind or brain, to give a "local habitation and a name," to what has hitherto been,

> But airy thoughts
> With nothing tangible in form or feature.

With the daguerreotypist, it is different; all the rays of genius which ever shone upon the human mind, would be of no use to him, unless aided by the more powerful assistance of the great orb of day! Yet we do not mean to imply that the daguerreotypist is a mere mechanical tool in the hands of nature. Not so; he has difficulties to encounter, which to a novice, at first seem insurmountable. No ignorant boor,

bungler, or self-conceited aspirant for fame can *ever* make a good daguerreotypist. Where the painter relies upon the bright visions of his brain—the daguerreotypist must rely upon mechanical experiments in chemistry and philosophy—throw aside romance and ideality (except so far as position or the arrangement of groups are concerned) and plunge deeply into salts, alkalies, and acids. All this requires patience, perseverance, *intelligence*; (for we persist in asserting that a boasting, arrogant, *ignorant* artist is a disgrace to the profession) but through all the "mists of ignorance" the true mind will at last shine out brightly, talent be properly appreciated, and native genius claim its reward.

But we are digressing from our subject, and giving a dissertation upon art, where we only intended to make a few common place remarks.

The Brothers Meade (how delightful seems that association of names, have been too long well known and appreciated both in this and foreign countries to require any very extended eulogium upon their character and merits. Their works speak for themselves. Commencing as most of our operators have done, in an humble way, they occupied a small room in Down's buildings in the city of Albany, in the year 1842. In 1843 they removed into the Albany Exchange. Their exertions were crowned with success, and upon their arrival in New York, they established one of the most elegant and agreeable resorts to which the lovers of art could wish to retire.

The brothers, ambitious to excel in the art to which they had devoted themselves, spared no pains or expense in rendering their collection of pictures equal to any others taken; and with the name and fame of Daguerre fresh and warm in each heart, they went forward with untiring energy in the glorious work. They not only imitated the improvements of others, but they succeeded in making other improvements themselves, which have become very popular. The first was a great improvement in the chemically colored backgrounds patented by Chapman, for which they were awarded a medal by the American Institute. From 1842 to 1843, the Meade Brothers practised with eminent success in different towns and cities of the United States, and had permanent establishments in Buffalo and Saratoga Springs, all of which they have since sold out, together with their Albany establishment, and are now permanently located at 233 Broadway, New York, where they have been nearly two years practicing, with their usual success. We cannot better give an idea of the extent of their reputation, than by quoting the following from the Albany Express:

"Their reputation extended, and now their name is heard in every place in the Union, and in many places in the Old World, where they have visited, or where the art is known."

In 1847 and 1848, Henry Meade went to Europe, and traveled through all the principal cities of England, France, and Germany. Few will believe that this art, of only a few years existence, has grown to be of so much importance. In 1848 after the return of Henry, Charles R. Meade visited Europe for the same purpose as his brother. The most important business accomplished by Charles, was his taking the portrait of Daguerre, the inventor, which was obtained with the greatest difficulty. He visited him at his chateau, Brie Surmarne, and it was through the influence of Madame Daguerre that he was at last successful. They now possess the only Daguerreotypes of Daguerre in this country; as he has always objected to sitting, and until this time, had steadily refused. There is a fine lithograph of him published by D'Avignon, New York.

Mr. Meade also took some fine views in Europe. In 1846 they sent views of Niagara Falls in elegant frames to the King of the French and the Emperor of Russia, for which they received presents and complimentary letters. These letters were published at the time all over the United States. There are many plans, we are told, which they have in operation, that will tend to elevate them still higher. In fact they are constantly doing, and a great portion of their success, may be attributed to original ideas, and an enterprising liberal spirit.

They forwarded by the St. Lawrence, 24 splendid Daguerreotypes, elegantly framed, for exhibition at the World's Fair, London, and they are among the most splendid and perfect daguerreotypes ever exhibited. Four of the pictures were pe-

culiarly appropriate for the fair of all nations. They represent the four quarters of the World, Europe, Asia, Africa, and America. The first represented by a beautiful group, surrounded by the arts, the second by an Asiatic in costume, on a divan, cross-legged, with pipe, &c., the third by two negroes, naked, excepting a tunic from the waist to the knees,—the fourth by a group of Indians. They have been much admired, and attract the attention of all true lovers of art. The Brothers employ in their establishment ten assistants, and have a collection of nearly 1000 pictures, to which they are constantly making additions. It may be truly said that they occupy an enviable position. Young, and of pleasing and agreeable manners, they have many friends, and few enemies.

Franklin brought down the lightning from the clouds,
Morse bade it act along the trembling wire;
The trump of Fame their praises gave aloud,
And others with the same high thoughts inspire.
Daguerre arose—his visionary scheme
Was viewed at first with jeers, derision, scorn,
Conquered at last by the grand power supreme
Of god-like mind—another art was born.
In mists the clouds dissolved like morning dew,
The world rejoiced to see the victory won;
With admiration, wonder, now we view
The effects produced by Nature's God, the Sun.
The mantle from the great inventor flown,
With tenfold splendor on his pupils fell!
France, England, and America have shown
The bright invention has succeeded well.
Go on, young brothers, in your great career,
With others in the art, joined heart and hand;
Be all improvements given with friendly cheer,
"Divided ye may fall—United ye must stand!"

ON THE OXY-HYDROGEN BATTERY.

BY C. F. SCHŒNBEIN.

IN the December Number of the Philosophical Magazine for 1842, Mr. Grove describes, under the name of a *Gaseous Voltaic Battery*, a voltaic pile which cannot fail of exciting the attention of philosophers. Having previously observed that, when two plates of platinum are placed in tubes containing oxygen and hydrogen, and are connected with the wire of a galvanometer, they have power to produce a deviation in the needle of this instrument, the English philosopher filled a certain number of tubes with diluted sulphuric acid, and introduced hydrogen into the upper part of some, and oxygen into the upper part of others; then, taking care throughout to connect a hydrogen tube with an oxygen tube, by means of a platinum plate, Mr. Grove formed a battery, with fifty of these pairs, on the model of the voltaic battery; he thus obtained an apparatus, which gave rather strong discharges, produced sparks distinctly visible between two fine charcoal-points, and possessed a considerable electrolytic power. When the tubes were filled with atmospheric air, instead of the above-named gases, and were connected into a battery, they gave no current; which was equally the case, when the tubes contained alternately, some carbonic acid and nitrogen or oxygen, others, nitrogen. Very feeble effects were obtained, when the successive tubes were alternately filled with hydrogen and nitrogen.

Mr. Grove, having advanced certain theoretical considerations on the pile, which I have just described, and myself having, a few years ago, experimented on the voltaic power of oxygen, hydrogen, water, and platinum, the results of which are very intimately connected with the more recent observations of the English philosopher, and are even in perfect accordance with the latest,—these two circumstances have induced me to subject the new pile, as well as the cause of its action, to a somewhat

more rigid examination; and I was the more willing to undertake this task, inasmuch as it is connected with certain scientific questions, which, in my opinion, possess some degree of importance.

In 1838, I discovered the fact that water, contained in a U tube, and through which the current of a battery has been passed, is not polarized or does not form an active pair except when the two columns of the liquid, contained in the two branches of the tube, are connected by means of platinum. More recently, I showed that water, containing hydrogen in solution, and which is combined voltaically with pure water, produces a current, that passes from the former of these liquids toward the latter, which is not manifest unless the two liquids are connected by means of platinum, or, at least, when the parc of the connecting metallic arc, which enters the solution of hydrogen, is formed of platinum.

I further demonstrated that a solution of oxygen in water, when combined voltaically with pure water, does not develop a current, and does not form an active pair even when the circuit is completed with platinum. Thus, in conformity with my preceding experiments, a current is not developed except when hydrogen water, and platinum, enter simultaneously into contact, and communicate, so as to form a circuit, which returns on itself, or a closed pair.

In a memoir, on the polarization of solid bodies and liquids, which I had the honor of presenting the Academy last year, and which was afterwards published in *Poggendorff's Annals*, I collected all the results which I had obtained on this subject, and advanced certain conjectures as to the cause of the phenomena which I had obtained on this subject, I therefore take the liberty of referring to it.

It clearly results from the Memoir, in which Mr. Grove describes his new battery, that the author attributes the development of the current to the combination of hydrogen and oxygen, a combination which, in his opinion, takes place under the catalytic influence of the platinum; but this supposition does not appear to me admissible, and for the following reasons:—

1. From my experiments, a current is obtained even when a solution of hydrogen in water is voltaically combined with water which is pure and perfectly deprived of oxygen, and when the circuit of the battery thus formed is completed with platinum. In this apparatus, the chemical action to which Mr. Grove attributes the current of his battery, cannot be entertained, because this battery contains no free oxygen. But it necessarily follows, from this fact, that one part at least of the current of the new battery, has another origin than that assigned to it by Grove.

2. If pure oxygen or atmospheric air is passed into the solution of hydrogen in my battery, the current, according to my observations, absolutely receives no increase; the contrary ought evidently to take place, if the immediate combination of oxygen with hydrogen produced as its result the development of a current.

3. The arrangement of the elements of Grove's new pile is of such a nature that it is difficult to conceive how the oxygen of one of the tubes can combine with the hydrogen of the other, seeing that the two gases are separated from each other by a thick layer of liquid. It is true that the communication between two consecutive tubes being established, by means of acidulated water, it may happen that a part of the oxygen in one of the tubes passes into the liquid of the tube containing the hydrogen, and reciprocally, that a part of the hydrogen passes into the oxygen tube, whence it follows that there would be oxygen in solution in the liquid of both tubes, and that the two gases would be in contact with the platinum plates plunged in the liquid. But, as the current shows itself as soon as the circuit is closed, that is, in an interval during which such a mixture of the gases cannot be admitted, it clearly follows that this current cannot originate from a direct combination of free oxygen with free hydrogen. Now the facts mentioned in the preceding paragraph show that the current of the battery would not receive any increase from the access of hydrogen into the tube filled with hydrogen.

Supposing even that the mixture of the two gases could take place very speedily, and that the presence of oxygen in hydrogen does augment the force of the current, it is easy to comprehend that these very two circumstances might also soon put an end to the current of the pile, for, if the devel-

opment of the current must really be attributed to the combination of hydrogen with oxygen, and if this chemical action take place not only in the tubes taken two and two, but in each or those which compose the pile, the currents, which would be due to these different actions, would in this case, of necessity, destroy each other, because they travel in contrary directions. These reasonings, to which I might add others of no less weight, show, in my opinion, most conspicuously that the development of the current of Grove's new battery is not due to the direct combination of the oxygen employed in this apparatus with the hydrogen.

It now concerns us to learn what is the true source or chemical cause of the current in question. In the memoir on Voltaic Polarization, which I have mentioned, the reply to this question has been anticipated, that is, I have advanced an opinion, which is rendered probable by facts, that the immediate cause of the current of my hydrogen pile is the presence of a sub-oxide of hydrogen which is formed of the hydrogen and the water, under the catalytic influence of the platinum. Now, as the current of this battery has the same direction as that of the current of Grove's battery, and as the resemblance between these two apparatus, in so far as the substances employed in their construction are concerned, is recognised at a glance, I have not the least doubt that the current in both cases is due to precisely the same cause.

If we can admit with certainty that the source of the current under consideration is not due to the direct combination of oxygen with hydrogen, and if experiment shows that the presence of the former of these gasses in the latter does not produce any augmentation in the intensity of the current; if, moreover, it follows from my previous researches that a solution of oxygen forming with pure water a voltaic pair, the circuit of which is closed by means of a platinum arc, does not develop any current, how comes it then that a battery, formed of tubes of oxygen, alternating with tubes of hydrogen, originates a more energetic current than that which is derived from an apparatus in which tubes containing mere acidulated water are alternated with tubes of hydrogen? In other words, what part does oxygen play in Grove's new battery?

From the developments contained in my last memoir, relative to the electrolyzing effects of the simple battery,* I am compelled to trace the origin of the augmentation of the force of the current to a depolarizing action of the oxygen, in preference to any other cause. In fact, the action of the current, which flows from a tube filled with hydrogen to the neighboring tube of oxygen, gives to the negative electrode, which is contained in the latter, a positive polarity by means of the hydrogen which is liberated on the surface of this electrode. But this positive polarity develops in its turn a secondary current, which, inasmuch as its direction is concerned, is opposed to the primary current, and which must consequently weaken it. Now, if the negative electrode in question is surrounded by a liquid containing free oxygen, the hydrogen liberated on this electrode, produces under the influence of the platinum, of which the latter is formed, a chemical combination with the neighboring free oxygen which also prevents the positive polarization of the negative platinum electrode, as well as that of the liquid surrounding it, and consequently opposes the weakening of the primary current.

The positive polarity, which the platinum acquires, as a negative electrode, being somewhat considerable, when compared with the force which develops it, it follows that the oxygen must produce a sensible augmentation in the force of the primary current of Grove's battery, in consequence of the depolarizing influence which it exercises in this apparatus. But it is possible, and even probable, that this same gas contributes also to augment the force of the current by the species of action, of which I have spoken in the memoir that I have already quoted.

If, then, Mr. Grove obtained but a feeble current, when he used, in his battery, nitrogen instead of oxygen, it is a result which can easily be understood; for the free nitrogen cannot, like oxygen, form, under the catalytic influence of the platinum, a chemical combination with the hydrogen liberated on this metal; nor can it

* *Poggend. Annal., No.* 9, 1842, and *Archives de l'Electricite,* t. ii. page 241, 1842.

prevent the positive polarization of the negative electrodes, nor, consequently, the feeble effects of the current arising from a battery of nitrogen and hydrogen.

The results of my previous researches on the polarizations of platinum, produced by the difficult species of gas, prevent our being in the least degree astonished that according to the observations of Mr. Grove, batteries, formed of tubes, in which oxygen alternates with nitrogen, or carbonic acid with oxygen, do not develop any current. From these results, the gases indicated above exercise absolutely no sensible depolarizing influence on platinum in its natural condition, much more they cannot destroy the polarities developed in a metal, by certain gaseous substances, such as chlorine or hydrogen. Or, which amounts to the same thing, an aqueous solution of nitrogen associated with an aqueous solution of oxygen, and connected with it by means of a platinum arc, does not constitute an active battery; because the platinum does not exercise any catalytic influence over such solutions, or does not determine any species of chemical actions.

I think it is to the point to give here some notice of a battery, which might be named the hydrogen and chlorine battery, because hydrogen and chlorine play an important part as electro-motors. With this view, I may be permitted to mention a battery, which I constructed and described several years ago. An aqueous solution of chlorine, voltaically combined with pure water, develops a current, when the two liquids are united by means of any metals so as to form a battery; and this current is determined from the pure water to the solution of chlorine. A fact, precisely analogous to this, is the observation that a plate of platinum, when plunged into chlorine gas, acquires negative polarity, or that the same plate, plunged into water with an ordinary platinum plate, forms a pair, in which the current is determined from the ordinary platinum to that which has been in contact with the chlorine.

Now, if a certain number of pairs of this kind were connected together, a chlorine battery would be obtained, the elements of which would be an aqueous solution of chlorine and pure water. It necessarily follows that the energy of this compound battery would acquire very considerable increase, when the solution of chlorine as well as the water, contains a certain quantity of acid, for example, sulphuric acid. But from what has been said above, the force of the current of this battery ought to increase to a still greater extent, if hydrogen gas were introduced into the cells, which contained only the solution of sulphuric acid; and that thus an acidulated solution of chlorine and an acidulated solution of hydrogen might be alternated in the battery so that the chlorine cell should in all cases communicate, by means of platinum, with the neighboring hydrogen cell. In a battery thus constructed, there is an electromotive action, not only in the chlorine cell, but also in the hydrogen cell, and these two actions develop currents, which have the same direction, and naturally assist each other.

It is not difficult to comprehend that, all other circumstances being similar, the force of the current of a battery of this kind must be much superior to that of the current of Grove's new battery; for, in the latter there is no other electromotive action than that in the hydrogen tubes, whilst in the other tubes the oxygen plays solely or principally the part of a depolarizing substance.

With regard to the depolarizing influence which the chlorine exercises over the negative platinum electrodes of the hydrogen and chlorine battery, it is readily seen that it is superior to that which oxygen exercises over the same electrodes, in Grove's new battery. Chlorine combines with hydrogen much more easily than does oxygen; so that the depolarization of the platinum electrodes must be brought about by means of the chlorine, in more rapid and complete manner than by oxygen; and this can scarcely fail increasing the amount [*grandeur Fr.*] of current from the hydrogen and chlorine battery.

On studying a little more closely this last kind of battery in respect to the depolarizing actions which take place in it, we find that it presents one circumstance, which does not belong to any battery hitherto known. In fact, the chlorine and the hydrogen play two parts at once. First, in consequence of their particular chemical relations to water, these substances exercise an electromotive action, and develop, in the battery currents, the direction of

which is, as we have already mentioned, similar; then, they destroy the polarities, which are developed on the electrodes of the battery by the action of the currents just mentioned. The positive electrodes are surrounded by the solution of hydrogen, the negative electrodes by the solution of chlorine; in consequence of the chemical action exercised by the current of the battery, ozone is developed on the positive electrodes, or else there is formed on these electrodes an oxide of hydrogen of a higher degree; whilst hydrogen is liberated, or a sub-oxide of hydrogen is produced, on the negative electrodes. By the action of the ozone or of the superior degree of the oxidation of the hydrogen, the positive electrodes acquire negative polarity; by the action of the hydrogen, or of the sub-oxide of hydrogen, the negative electrodes acquire positive polarity. Now, the hydrogen, which, in a state of solution, surrounds the positive electrodes, combines with the ozone liberated on these electrodes, or with a part of this same gas, which is found in the sub-oxide of hydrogen, the existence of which I have supposed.

A battery may be constructed, precisely analogous to the hydrogen and chlorine battery, with a solution of hydrogen and metallic oxides; and my experiments have taught me that the peroxide of lead or of silver is particularly suited to this purpose. The peroxides, or rather the second proportion of oxygen, which they contain, act in every respect in an apparatus of this kind, as chlorine does in the hydrogen and chlorine battery: they are, at the same time, electro-motors and depolarizers.—Hence, if oxygen in the gaseous state in Grove's new battery, is replaced by peroxide of lead, a battery is obtained, which, under equal circumstances, gives a stronger current than that which is developed by an oxy-hydrogen battery.

It is scarcely necessary to remark that the batteries, of which I have just spoken, can neither be recommended on account of their economy, nor of their energy. Nevertheless, in a theoretical point of view, they possess a great degree of interest, inasmuch as they show, with the greatest distinctness, the intimate relation by which the chemical properties of bodies and their electro-motive state, that is chemical action and voltaic phenomena, are connected. But the battery or series of hydrogen, water and platinum, appears to me very specially to deserve the attention of philosophers, for the reasons I am about to advance. Among all known metals, platinum is the only one as appears from the researches I have made which possesses the power of developing a current, by its contact with hydrogen and water; and, as it is the same metal which also possesses particular relations to oxygen and hydrogen, that is to say, which, in its contact with these two gases, develops in an extraordinary manner, their chemical affinities, it is really a difficult matter to refrain from attributing these different modes of the action of platinum to the same cause, namely, to that unknown force, to which Berzelius gave the name *catalytic.* Now, if these two modes of action proceed from the same cause, a fact of this kind ought to possess a high degree of scientific interest, because it might furnish the proof that the catalytic power, as well as ordinary chemical affinity, might, under given circumstances, produce voltaic phenomena, or act as electro-motive force.

But, if once we discover with certainty a single case, in which chemical modification produced in a substance by catalytic action, is accompanied by the development of a current, we may expect that this case will not remain isolated, and that we shall eventually succeed, not only in discovering other similar cases, but also in throwing some light on the at present obscure relation which exists between catalytic force, and ordinary chemical affinity. Now, it is easy to see how important the exact determination of this relation would be to the theoretical part of chemistry, and how bright a light would be thrown on an entire class of phenomena, as soon as the nature of the chemical actions of contact should be known.

We could not then, in the whole field of physico-chemical labors select one which would offer more interesting points, or which would promise more important results than that which I have just pointed out. So that I am encouraged to hope, that, ere long, active researches will be made in this field, which will assure great conquests to science.

But there is still one other point of view under which the power that the catalytic force might possess of developing voltaic

currents, may offer some degree of interest. It is well known that philosophers are not wanting in Germany, who still faithfully believe, with Volta, that the principal source of hydro-electric currents lies in the contact of heterogenous bodies, and who consider the chemical modifications, which occur in the battery, as nothing more than secondary actions, or as the effects of currents due to simple contact. Now, notwithstanding the great number of facts, which the partizans of the chemical theory of galvanism have endeavored to advance in order to prove its correctness, not one has been regarded by its adversaries as possessing the force of conviction, not even those which Faraday made known in his last paper,* and which many philosophers have considered decisive. In like manner the partizans of the contact hypothesis, from time to time, advance facts and experiments which, in their opinion, ought to demonstrate unanswerably the incorrectness of the chemical theory, and to serve as *experimenta crucis* in favor of their opinion. Not one of these experiments has as yet been generally recognised as conclusive; so that the debate upon the source of voltaic electricity has not yet terminated.

Although, so far as I am myself concerned, I have not the slightest doubt that chemical action and the development of the current are associated in the relation of cause to effect; and although I think that there exists a sufficient number of facts, by means of which every unprejudiced man may form a conviction relative to the debate in question, it would be desirable, for the sake of science, that a phenomenon should present itself, the nature of which would leave so little material for doubt, that only one conclusion respecting its cause could be drawn. A phenomenon of this kind we may hope to find in the currents which are, in certain cases, developed by the catalytic power of a body.

If, for example, two conducting liquids, were voltaically combined, and it were demonstrated that a battery of this kind has no action, when the circuit is closed with a conducting body, which would not exercise on one or other of the two liquids either an ordinary chemical action, or a catalytic action; if, moreover, this same battery produced a current when the circuit is closed with a conducting substance which produces, by catalysis, in one of the two liquids, a chemical modification of a synthetic or analytic nature, ought we not to conclude, from such facts, that the current obtained under these circumstances, would have its origin in the chemical modification which would have occurred? So far as I am able to judge, this conclusion would not only be admissible, but by far the most natural and the most simple which could be made.

Some time ago, I showed that we possess in pure water and in an aqueous solution of hydrogen, two liquids of the character of those of which I have just spoken and that we may with their aid construct the battery in question. This battery, when connected with gold, silver, copper, &c., does not produce any current; but a current is obtained, when, in order to complete the circuit, a metal is employed, which acts in so extraordinary a catalytic manner on oxygen and hydrogen, or on oxygen and certain hydrated combinations (for example alchohol and ether), that is to say, platinum.

Ought not the current obtained with this metal and the hydrogen battery, which I have mentioned, to be regarded as an *experimentum crucis* in favor of the chemical theory of galvanism? I abandon to impartial and competent philosophers, the decision of this question.

Bale, January 1843.

* Exp. Researches, Series 16.—Ed.

From La Lumiere.

PHOTOGENIC AND ACCELERATING SUBSTANCES.

TRANSLATED BY C. DORATT.

THE Art of Photography is based on the ins'ability of the salts of silver under the influence of light. This agent communicates to the chemically aggregated a'oms, a disturbance, tending to the seperation of the silver, from the mineral atoms. These results produce in the compound a succession of metamorphoses, continually altering its chemical and physical properties, changing its surface, that is to say its color. Most of the precious metals, easily reducible, present these photogenic compounds; such as gold, iridium. &c; but are, in this respect, far inferior to silver. Even this metal furnishes compounds sufficiently photogenic, only when combined with certain minerals, forming a family of four in number, fluorine, chlorine, iodine, and bromine. The salts of silver, alone, have not presented as yet sufficient sensitiveness to be employed alone.

FLUORINE.

The physical properties of Fluorine, are at present unknown. It has not been isolated, owing to its great affinity for silicum which it rapidly absorbs even from glass, which it instantly corrodes, thereby destroying i's transparency, and thus concealing its mysterious transformations.

This inconvenience might perhaps be obviated by the use of glass with an acid base, phosphoric or boracic, which might resist the action of the fluorine and allow its color to be seen, if it have any.

Although fluorine is unknown in an isolated state, it is well known to exist in the minerals, to which it imparts a vitreous appearance, and great hardness, such as fluorspar and topaz, which latter, when very limpid, resembles the diamond and easily scratches rockcrystal.

Should it ever be isolated, there is no doubt, but that it will be found to be a gas of a permanent densi'y, say of 1.28. Hydro-fluoric acid, the result of its combination with hydrogen, is a gas easily liquified, and very corrosive. It unites with water rapidly, and in this state is used to engrave on glass. It is disengaged by the action of sulphuric acid on pulverized sulphur or fluoride of calcium.

Fluoride of silver is very soluble in water, and thus easily distinguished from its compounds with the other three minerals. It is, however, very unstable, it would therefore be interesting to study its photographic properties.

CHLORINE

Is well known—it is a simple body, under the appearance of a yellowish green gas, which under a pressure of several atmospheres, becomes a liquid of the same color. Its density in the gaseous state is 2.44, as a liquid 1.33. Combined with heat, it attacks all the metals, cauterises and disorganizes animal membranes, when damp. This is the cause of its fatal action on the lungs when respired.

Combined with hydrogen, it produces chlorohydric acid, a nearly permanent gas, of great affinity for water which absorbs about 500 times its volume. In this state, it forms the concentrated fuming chlorohydric acid.

There is no doubt but that this acid may be used as an accelerator. In my own practice I have not had much success in its use; nevertheless, its extreme cheapness renders it worthy of the investigation of operators. I have always considered hydroacids as being objectionable, still such may not be the case.

BROMINE

Is a simple body, naturally in the state of a yellowish red gas, density 5.39. It is easily condensed into a liquid of a deep red brown color, which appears green by reflection. Its density is 2.97—it boils at 47°—and congeals at 20°—the crystals being interlaced and of gray color—its penetrating odor is well known—it attacks the respiratory organs and in a liquid state

corrodes animal membrane, eating away the whole piece.

Hydrobromic acid is very expensive and useless in photography.

IODINE.

Differing from the three last named bodies, Iodine is solid at ordinary temperatures, as a tincture, and after evaporation the surface is of a beautiful gray color, formed by microscopic crystals of iodine.

When the evaporations of the alcohol or ether has not been complete, and it takes some time to render it so,) the iodizing operates badly, without good results, but when entirely evaporated, it becomes successful for a certain time, as the deposition of crystals on the paper or pasteboard is in very small quantity, the process is therefore very inconvenient. Now it is quite different, as regards the use of the iodine in a solid state. Its density when pure is 4.95; in vapor 8.71. This vapor is of a fine violet color, and is visible in the vase when the temperature has attained 20°. It is this property of giving off its vapor with regularity, that renders it so valuable in the Daguerreotype. As it is found in commerce, it is difficult to pulverize, and means have been devised to cause it to part with its vapor more regularly; we will mention a few of the methods at present in general use.

1st. By dissolving it largely in alcohol or ether, and saturating therewith sheets of paper or pasteboard. This answers well in equalizing the vaporation.

2d. By combination with lime, magnesia or oxyde of manganese. The two first are excellent and much used, the latter presents difficulties. As to the proportions to be observed, they must depend on the judgment of the operator and the temperature of his rooms.

CHLORIDE OF LIME.

Nothing has been said, that I am aware of, of the action of chloride of lime. It is known in a commercial point of view, as a combination of chlorine and lime, having the property of disengaging chlorine gas, and found at all druggists. This compound may be employed with much success in the art, and I have mentioned it on account of its cheapness. The same remarks apply to the chloride of soda or Javel water, which derives its name from a village near Paris where it is extensively made.

BROMIDE OF LIME,

According to Mr. Vaillat is best made by pouring 50 grammes of pure bromine into a bottle containing 500 grammes of slacked limes; after closing the bottle and shaking it well for some time, allow it to remain undisturbed for 24 hours. It is then opened, the lumps broken down, and 50 more grammes are added. This addition is continued until the lime becomes of a rich scarlet color, when it is fit for use.

CHLOROBROMIDE OF LIME.

I now give the receipt of M. Baron Gros for this excellent compound. Bromide of Lime is first prepared, by saturating slacked lime with bromine vapor. When the lime (which it is best to employ rather damp) has attained a good orange color (like red sealing wax,) the capsule containing the bromine is removed, and replaced by one containing chloride of bromine. Under the action of this latter vapor, the mixture becomes of a pale yellow color, resembling sulphur. The compound is then stirred with a glass rod, and on removing the upper crust, the interior will be seen to be of a deep blood red color. The absorption of the vapor is continued, until the whole mass becomes of an even color, and vapors of a reddish tint are perceived in the bottle. It must be left in repose for a day or two, well closed, and will then be fit for use.

BROMO-IODIDE OF LIME.

I give this name to the preparation resulting from the treatment of lime, with the yellow chloride of iodine. It is however to be presumed that the chloride used must be deprived of water, that is to say, distilled over chloride of calcium.

THE NEW YORK STATE DAGUERREAN ASSOCIATION.

AS this Association met on the first Tuesday of this month we have endeavored to collect a few facts in relation to its history which we shall embody in our present article. The idea of a Photographic Association may be said to have entered the minds of several gentlemen at the same moment, but owing to a mistaken conclusion that the attempt to form one would meet with decided opposition on the part of the majority of daguerreotypists, none were found bold enough, at first, to give the idea a tangible form. It was during this state of affairs that the daguerreotypists of Utica resolved to organize themselves into a Society for their mutual benefit and improvement in the art.

Among the most active in this organization were Messrs. D. D. T. Davie and J. M. Clark, of Utica, Sissons of Albany, and Whitney and Denny of Rochester.

In the fall of 1848, Mr. Davie took a broader and more comprehensive view of the principle, and spent much of his time and money in visiting and conversing with daguerreotypists in New York, Albany, Syracuse, Rochester and Buffalo, and many with whom he conversed on the subject promised their hearty co-operation. Others opposed the measure on the ground that daguerreotypists generally were such a selfish and ignorant class of men, that it would be an impossibility to get them sufficiently interested in the matter to sustain an Association. In a majority of these cases the very men who put forward the argument might be classed among those they thus censured.

In the fall of 1850, Mr. Davie made a visit to New York city for the express purpose of ascertaining the views of daguerreotypists in this city on the measure, and he had the satisfaction of finding that Messrs. Brady, Lawrence, Haas, Morand, Beckers & Piard and Harrison, were strongly in favor of the movement and desirous of seeing it accomplished, but unwilling to take the first steps.

This apparent lukewarmness we know to have been caused by a fear of being considered too forward and assuming a position that might be deemed arrogant. They prefered that those who had already agitated the subject should be the prime movers. There was some feeling, however, of jealousy, on the part of others favorable to the movement, who very unjustly supposed that the active part taken by Mr. Davie was merely dictated by ambitious motives towards the presidential chair. If such was Mr. Davie's ambition it was a noble one; one that should have actuated every breast, and would have done honor to all who entertained it, and therefore should not be a cause of censure. Mr. Davie was, however, perfectly willing to submit to the will of the majority, and we think his subsequent course proves this, for although he was not elected its first president he has not abated one particle in his enthusiasm and interest for the Association.

He returned home fully convinced that some movement must be made, and that, as no one else seemed willing to take the responsibility he determined to do so himself. He therefore drew up a call for a convention of daguerreotypists to be held at Syracuse, and obtained the signatures of a large number of artists in western New York, of whom we can only remember the following—and we regret our inability to remember all, as they well deserve to have their names recorded here, to be held up as a noble class in their art, and we shall be happy to correct this list at any time:

D. D. T. Davie, of Utica.
F. J. Clark, " "
D. B. Johnson, " "
Geer & Benedict, of Syracuse.
J. M. Clark, " "
B. F. Higgins, " "
C. B. Denny, " Rochester.
E. T. Whitney, " "
Sherwood & Parsons, of Auburn.
G. N. Barnard, " Oswego.
L. V. Griffin, " Geneva.
O. B. Evans, " Buffalo.
N. E. Sissons, of Albany.

These gentlemen, with a number of others, about thirty, met in pursuance of the call

at Syracuse on the 12th of July, 1851, when the following proceedings were had.

"E. T. Whitney, of Rochester, was elected Chairman, and C. B. Denny, of Rochester, F. J. Clark, of Utica, and B. L. Higgins, of Syracuse, were appointed Secretaries. Remarks were made by D. D. T. Davie, of Utica, P. H. Benedict, of Syracuse, and G. N. Barnard, of Oswego, stating the object of the Convention to be a union of thought, action, sentiment, a uniform standard of prices, and to devise means to elevate this beautiful art in which we are engaged. Received a communication from H. H. Snelling, editor of the Photographic Art-Journal, which was read by the Chairman.

"Resolved, On motion, That a committee be appointed to draft resolutions to be presented to this Convention.

"The Chairman appointed D. D T. Davie, of Utica, G. N. Barnard, of Oswego, P. H. Benedict of Syracuse, L. V. Griffin, of Geneseo, as such committee.

"After a short time, the committee presented the following preamble and resolutions, which were unanimously adopted:

"Whereas, the Daguerreotype likeness, when properly executed, is more faithful to nature than any other style of portraits; and whereas, many imposters are flooding our country with carricatures at a much less price than a good picture can be afforded for, thereby not only robbing their patrons, but degrading this most beautiful art, and what is still worse those who are competent to practice the art successfully —those who would improve and go on from one improvement to another until the last victory was achieved; and whereas, these men are held in poverty and disparagement by the mere catchpennies who hold themselves up to the world as artists, when they are not—And whereas the increased demand for the best miniatures that can be taken calls for a fair compensation for the same, in order that operators may be encouraged to use still greater effort in trying to excel in this most beautiful art. Therefore—

"Resolved, That we form an association, to be called The New York State Photographic Association.

"Resolved, That a committee be appointed to draft a Constitution and By-Laws to be reported at an adjourned meeting to be held at Utica the 20th day of August, 1851.

"Resolved, that we do all in our power for the advancement of the art, aid each other in the study of the same, and bury forever all feelings of envy and jealousy which have hitherto existed.

"Resolved, That we discountenance operators giving instructions to any but those whose natural talents and moral standing qualify them for successfully practicing the art.

"Resolved, That we believe it to be the interest of all respectable operators to join this Association, and that we earnestly solicit all lovers of the art throughout the State to co-operate with us in our efforts to advance and retain for the art the highest state of perfection.

"The convention then appointed M. A. Root, of New York, D. D. T. Davie, of Utica, and O. B. Evans, of Buffalo, a committee to draft a constitution and bylaws to be presented at the next meeting.

"The minutes were then read and adopted.

"Resolved, That the Photographic Art-Journal, the Daguerrean Journal, and all editors who feel desirous of forwarding our object, be respectfully requested to publish the proceedings of this Convention.

(Signed) E. T. Whitney, Chairman.

C. B. Denny,
F. J. Clark, } Secretaries."
B. F. Higgins,

It was thought expedient, by those present at this meeting, not to organize an association at that time, in order that all the New York City Daguerreotypists might have an opportunity of taking part in the noble work, particularly as it was understood that few in that city had seen the call, it having been published in the country papers only. The convention, therefore adjourned to meet in Utica on the 20th of August following.

In the interim every exertion was made by the friends of the measure to call out a free expression on the subject, and create a healthy interest on the part of all daguerreotypists. Here again they were met by jealous dispositions and a movement for a separate organization was made by some of the New York artists. This movement, although it did not have the desired effect, was managed in such a manner that it

turned for a time many well disposed towards the Utica convention to itself, and its real meaning was so apparent that it created considerable ill feeling between the country and city Daguerreotypists. This happily was but momentary, and when the convention met on the 20th of August, the City of New York was fairly represented by Messrs. Haas, Morand, Selleck, and Turner, and we trust all animosities were there buried, as the proceedings were conducted with the most perfect harmony and good will.

The acts of this conventien and the subsequent proceedings of the Association we have already laid before our readers. It now remains for the daguerreotypists of the State of New York to say whether or not the Association shall be sustained and its usefulness made fully apparent. There is much that has been left undone in its past career, and much to be done for the future. We think that two meetings a year are not sufficient to keep up that interest which it demands, but as daguerreotypists are too much scattered over the state to make monthly meetings feasible we would recommend quarterly meetings at a central point, for debate or lectures, and that—for the benefit of those who cannot attend—a suitable phonographist be employed to take down these debates for publication, that those at a distance may be benefitted by them. We would also suggest the propriety of the members of the Association in each city or town, meeting occasionally for the same purpose and transmitting to the president of the Association copies of their proceedings to be read at the regular meetings and for publication. Where the towns are small and contain but one or two artists, several from the nearest towns might assemble at the most central point and form themselves into a subordinate Society.

In this way a constant interest will be kept up throughout the state and a much greater amount of usefulness will be accomplished than in any other way.

From the New York Tribune.

THE MYSTERIES OF SCIENCE.

VERY justly prominent among the scientific men of the present day is Baron CHARLES VON REICHENBACH. Endowed with a genius as bold as it is active and an intellect equally acute and free from prejudice, after a career of nearly thirty years in extensive industrial enterprises, such as iron foundries, chemical laboratories, beet sugar factories, in which he amassed an immense fortune, while his discoveries in chemistry and his contributions to geology assured him a high and solid reputation, the ordinary tribe of savans were astonished to see him quitting the beaten tracks of scientific research to venture into the mysterious and shadowy domain of human magnetism, hitherto resigned mainly to the possession of charlatans and wonder-workers by trade. Few books of recent times have produced a deeper sensation in the world of scientific orthodoxy than Reichenbach's *Dynamics of Magnetism.* In that work the distinguished author discusses questions which his colleagues had before avoided with all the originality and boldness that must characterize a scientific discoverer and all the clearness of statement and the coolness of self-possession with which he would discuss an ordinary problem in geometry or chemistry.

It is the opinion of Baron Reichenbach that he has discovered a new fluid, or rather a new dynamic element in nature. This is distinct from magnetism, electricity, heat and light, though akin to them. It is of a finer and less palpable character than either of those elements, and is perceptible only to persons of a more delicate nervous organization. This element he calls "Od," a name whose etymology he has not yet explained—and those who are subject to and can perceive its influence,

he distinguishes as "sensitive." These are the persons who are generally regarded as capricious and whimsical; who cannot bear the color of yellow, while more than others they love the color of blue; who hate to look at themselves in a glass; who will not sit on the middle of a bench with others, but insist on having the corner seat; who cannot sleep on the left side; who cannot eat with a spoon or fork of German silver, or of any composition made to imitate silver, who cannot eat warm, much-cooked, fat or sweet food, but have a passion for sour dishes; who dislike the heat of an iron stove, while they will bear an even greater heat from one of clay or porcelain; who, in an omnibus or railroad car, insist on having the windows open, no matter whether their fellow travelers fear colds and rheumatism or not; who cannot bear to have any one behind their chair, and do not like to shake hands; who are subject to the influence of the moon and shun its light as disagreeable, &c. &c. These peculiarities says Reichenbach, you do not find singly but always the same person possesses several of them. They are not mere caprices but genuine perceptions of real facts, which however the mass of men are not organized to appreciate. Indeed, he says, there are two sorts of men, those who have nothing of this impressibility, and those who are acted upon in the manner above described. The latter are, strictly speaking, "sensitive," and, in fact, are often more susceptible than the Mimosa. And they are so in their inmost constitution, which they can neither lay off or deaden.

The present statements are derived from a series of articles, which Reichenbach is now publishing in the Augsburg *Allgemeine Zeitung* under the title of *Odisch-Magnetische Briefe* (Odylic Magnetic Letters.) In these articles he details a number of curious but simple experiments which any one may verify for himself without difficulty and which go far to establish the existence of this new fluid or elemental force in nature. It is only necessary to find a person belonging to the class our author calls "sensitive." It is, he says, not at all difficult to find such; they are numerous everywhere. If you do not at once find those who are perfectly healthy, inquire for restless persons who have unquiet sleep, who, when asleep, cast off the covering, talk or get up in their dreams, are troubled much by short fits of head-ache, often complain of sudden pain in the stomach, of being out of sorts nervously, who do not like large companies, but prefer the society of a few friends or even solitude. With rare exceptions these people are of more or less sensitive constitution.

But these are only the trivial aspects of the subject; when tried by the test of scientific experiment, things of quite another scope are manifested. Procure a natural crystal; as large a one as possible, either a gypsum spar of about eight inches long or a sulphur spar, or a Gothard rock crystal of a foot long, and lay it horizontally across the corner of a table or the arm of a chair, so as to leave the two extremities free. Then bring the sensitive person up to it with directions to hold the palm of the left hand towards the ends of the crystal, at a distance of three, four, or six inches. In the course of a minute he will tell you that from the apex of the crystal a cool current strikes the hand, but that when the hand is held toward its base a sensation of lukewarmness is produced. The coolness he will find pleasant and refreshing; the lukewarmness is accompanied by an unpleasant repulsive, and almost nauseating sensation, which, if the hand is continued there, presently seizes upon the arm and renders it as it were, altogether fatigued.

When Reichenbach first observed this phenomenon it was as new as it was inexplicable. Nobody would believe it. Since then he has repeated it on hundreds of sensitive persons (at Vienna) and it has, been tried in England, Scotland and France and any one can easily try it. Let a sensitive person hold his left hand near other parts of a crystal, and he will now feel tepid and now cool emanations, but they will be incomparably fainter than at the two opposite ends, which are also polar opposites. Persons who are not sensitive perceive nothing.

Since these opposite sensations can be produced without touching the crystals, at the distance of several feet, it was evident to Reichenbach that from these half-organized stones something emanated, flowed, radiated, which physical science had not yet recognized, and which, even if we are unable to see it, yet demonstrates its existence by corporeal effects. As sensitive

persons are able to perceive by feeling so much more than others, it seemed possible that they might be superior in the sense of sight, and in deep darkness might be able to see something of these singular emanations. In order to test this, on a very dark night, (May, 1848,) Reichenbach carried a very large rock crystal to the house of a highly sensitive young lady, Miss Angelina Sturmann; by accident, her physician, Prof. Lippich, a well-known German pathologist, was present. They produced perfect darkness in two rooms, in one of which Reichenbach placed the crystal in a place unknown to all but himself. After a brief delay in the other room, in order to accustom the eye to the darkness, they led the young lady into the room where the crystal was. Almost immediately she pointed out the spot where Reichenbach had placed it. She said that the entire body of the crystal was glowing with a delicate light, and that at its apex was in constant waving motion, a flame of blue color and bell shape, as large as one's hand, now and then sparkling, and disappearing in a sort of fine mist. At the other, or flat end of the crystal, she saw a slow, red and yellow smoke. This experiment has since been followed by thousands of others with crystals, in countless variations, down to the present time. The fact has been demonstrated by a great number of sensitive persons that sensations produced by crystals are accompanied by appearances of light, which are blue, and red, and yellow, from the opposite poles of the crystals, and are perceived by sensitive persons alone.

This experiment can only succeed in absolute darkness. The crystal light is so delicate and so very weak, that if even a trace of other light is perceptible in the darkened room, it will suffice to confuse the sensitive observer, that is, to deaden his sensibility for this extremely faint light. Moreover, few persons are so highly sensitive as the young lady above named, or so able to perceive this tender radiance after being for so brief a period in darkness. With ordinarily sensitive persons, says Reichenbach, it has generally required one or two hours, in the dark, for their eyes to become sufficiently free from the excessive impres sion of day or lamp light and prepared to perceive the light of the crystal.

But the same force will be found to emanate from other sources, with greater power. Place a sensitive person in the shade and give him a common empty barometer tube, or even an ordinary cane in the left hand. The tube or stick must be held in the sun, while the person and the hand remain in the shade. You will expect that the person will feel the tube or stick growing warm. But the fact will be exactly the reverse. The sensitive hand will experience various sensations, but the result will be one of coolness. Draw the stick back into the shade, and the coolness will cease and the stick will feel warm again; put it back in the sun and it will again become cool, and so on; in this way the exactness of the sensation may be tested.—There are, therefore, very simple circumstances, not hitherto observed, in which the direct rays of the sun do not produce the warmth but the contrary.

If this coolness be the effect of the new fluid called Od, it must in some way produce light in the dark. This you may try by repeating the following experiment. From a lighted room Reichenbach conducted a copper wire into a completely dark one. Then he held the other end of the wire in the sunshine. Hardly was this done when the portion of the wire that was in darkness began to shine, and at its point there rose the appearance of a flame about the size of one's finger. It was evident that the sun imparted odylic substance to the wire which sensitive persons saw flowing forth in the darkness in the form of light.

But go a step farther; let the sunbeam fall upon a good glass prism so as to cast its colors on the nearest wall. Let the sensitive person try the colors one after another, with the glass tube in his left hand. Holding it so as to intercept only the blue or the violet color, he will experience a most agreeable sensation of coolness, much purer and cooler than from the entire ray of the sun. But if he puts the tube into the yellow, or still better into the red color, the agreeable sense of coolness will at once disappear and be succeeded by warmth and a disagreeable feeling of sultriness will soon weigh on the whole arm. Instead of the tube you may place a naked finger of the sensitive person in the colors and the effect will be the same; Reichenbach chooses a tube or a stick simply in order by a bad conductor to prevent the action on the hand

of the actual rays of heat. These efforts of the separated sunbeam will be found exactly similar to those of the poles of crystals. This shows that Od of both kinds of efficiency is contained in the sunbeams; it flows to us with light from the orb of day at every moment, and forms a new and powerful agency whose extent we do not yet comprehend.

Recur for a moment to those haters of the color of yellow, and ardent lovers of blue, mentioned above. We saw that the same pole of the crystal which imparted agreeable coolness gave a blue light. We find here, that the blue ray in the sunbeam produces an altogether agreeable sensation of coolness. On the other hand, the red and yellow and red ray of the sunbeam cause lukewarm and unpleasant sensations. We see, then, that in these two cases, remote as they are from each other, blue causes pleasant and red and yellow unpleasant sensations. This is an indication which may render us less prompt to condemn what we call the caprices of sensitive persons. We see that in fact there is something hidden in these colors beyond their mere optical effect on our retina; that a profound instinct for an unknown but most delicate something guides the feeling and the judgment of such persons; and that this is worthy of very careful attention.

But apart from color, there is another easy experiment, to distinguish the Od contained in the sunbeams. Polarize them in the well known manner, so as to let them fall at an angle of 35 degrees on a pile of a dozen panes of glass. Then let the sensitive observer hold the stick in his left hand, alternately in the reflected and transmitted light. You will always find that the first produces the sensation of odylic coolness, the second of odylic lukewarmness in the hand holding the staff.

Reichenbach gives another experiment for the benefit of the chemists. Take two equal glasses of water, put one in the reflected sun light and the other in the transmitted. After they have stood six or eight minutes let a sensitive person taste them. He will tell you that the water from the reflected sunbeams tastes cool and somewhat acid; and that from the transmitted light tepid and bitter. Then put a glass of water in the blue light of the prism and another in the red and yellow; or put the one at the pointed end of a rock crystal and the other at the butt end. In all three cases the sensitive person will find the water from the blue light agreeable and delicately acid, that from the red and yellow disgusting, bitter and acrid. The first glass he will empty with gusto; but if you constrain him to drink the other he will very surely vomit afterward. Then give the water to the chemical analyst to discover its bitter and acid principles if he can.

The same treatment is to be observed with moonlight as with sunlight. You will obtain similar results, though in some respects they will be reversed. A glass tube held by a sensitive person in full moonlight will give not cool but lukewarm sensations. A glass of water that has stood in the moonlight will be more tepid and unpleasant than one that has stood for the same time in the shade.

You are now impatient to learn what this is, and where in natural philosophy and physiology these phenomena are to be classed. They are not effects of heat, though they produce sensations like those of warmth and coolness; for there is, in crystals, at least, no source of warmth, and if there were, non-sensitive persons would perceive it as well as sensitive, or it would certainly affect a fine thermometer. They are not electricity, for in crystals there is no exciting cause for the constant currents which here flow forth; an electrometer is not affected, and an attempt to apply a conductor, according to electrical laws, has no result. It is neither magnetism nor diamagnetism because crystals are not magnetic, and diamagnetism does not act in the same way in all crystals, but in very different and opposing ways, which here is not the case. It cannot be ordinary light, because that never produces the sensations of tepidity and coolness.

Equally curious are the experiments in connection with terrestrial magnetism. Lay an ordinary magnet across the corner of a table, so that the two ends will project; then place the table so that the magnet will lie in the meridian, with its north pole to the north, and *vice versa*. A sensitive person will perceive with the palm of the left hand a cool current flowing from the north pole and a warmish one from the south. Glasses of water placed near the poles will be affected just as if placed in the

reflected or transmitted sun light. So, also, in complete darkness, magnets exhibit odylic light to the eyes of sensitive persons. The light from the north pole of a magnet is blue—from the south pole, red and yellow. By holding the magnet vertically, with the south pole up, the light increases; if the magnet is strong enough, it rises to the ceiling, so that the sensitive person can distinguish colors painted there. Or, place a large horse-shoe magnet on a table with the two poles upward. Two distinct flames will be seen rising from it. Unlike the magnetic currents, they do not mingle, and neither seems to influence the other. A magnet of a hundred pounds' power gave forth a light of great beauty, illuminating a space of six feet on the ceiling; objects held close to the flame cast a visible shadow; objects held over it turned it aside and blowing it changed its direction, just as if it were any other flame; with a sun-glass, the light could be collected and condensed in a focus. The appearance is, therefore, altogether corporeal, and in many respects like ordinary flame. When two of these flames are brought together, they do not mingle, but penetrate each other; the stronger divides the weaker, which reunites itself after having been thus traversed; the same is the case when a stick is held in this flame. And, just as crystals appear to be prevaded with this luminous substance, so is it with the steel of magnets; every particle seems to be in a whitish glow. The same is the case with electro-magnets.

Those phenomena are not magnetic, says Reichenbach. The emanations from a crystal of the same weight are much stronger than from a magnet, but the crystal possesses no magnetism. We have then, in these two cases, Od in connection with magnetism and without. Therefore Od must be regarded as an independent force, appearing sometimes in connection with magnetism, just as it appears in connection with crystals, with the sunlight, and with other natural phenomena. We know the resemblances of magnetism and electricity, we know that each appears in intimate connection with the other, and have come near regarding them as identical. So it is with light and heat; the one produces the others, and they are always found together, but we have never been able to demonstrate the common cause from which both have their origin. So it is with Od. We suppose these dynamic phenomena spring from a common source, but as long as we are unable to demonstrate this unity of their origin, there is nothing left but to consider them as electricity, magnetism, light, heat, &c., and to treat each as a special group of phenomena. And as the multiform Odylic phenomena can be classified in neither of these groups, we must combine them into a special group. That they are inferior either in extent or importance to none that have already obtained a place in physical science, our author promises to show hereafter.

ON THE HARMONY OF COLORS, IN ITS APPLICATION TO LADIES' DRESS.

BY MRS. MERRIFIELD.

WE copy the following from the London Art-Journal, as it is well calculated to teach the daguerreotypist how to instruct his lady customers to dress for the daguerreotype. It will also be acceptable, we doubt not, to our lady subscribers.—*Ed. Pho. Art-Journal.*

One of the most important advantages of the Great Exhibition has been the comparison which it enabled us to make between our progress as a nation, and that of our continental neighbors, in those various useful and elegant arts which contribute so much to the comfort and enjoyment of life. In many branches ot industry the English need not fear competition with any nation ; in others we must admit our inferiority. Since the opening of the Exhibition, the public journals have abounded in censures on the arrangement of colors in the British department, which was said to be far inferior to that of the foreign contributors. It has also been asserted that the dress of the English ladies is, generally speaking, chargeable with the same defect. Our own impressions, and subsequent observation, induce us to think the charge is not without foundation. Colors, the most heterogeneous, are often assembled on the same person ; and on the same figure may sometimes be seen all the hues of the peacock, without their harmony.

The same incongruity may be frequently observed in the adoption of colors, without reference to their accordance with the complexion or stature of the wearer. We continually see a light blue bonnet and flowers surrounding a sallow countenance, or a pink opposed to one of a glowing red ; a pale complexion associated with canary, or lemon yellow, or one of delicate red and white rendered almost colorless by the vicinity of deep red. Now, if the lady with the sallow complexion had worn a transparent white bonnet, or if the lady with the glowing red complexion had lowered it by means of a bonnet of a deeper red color, —if the pale lady had improved the cadaverous hue of her countenance by surrounding it with pale green, which, by contrast, would have suffused it with a delicate pink hue, or had the face

> "Whose red and white
> Nature's own sweet and cunning hand laid on,"

been arrayed in a light blue, or light green, or in a transparent white bonnet, with blue or pink flowers on the inside, how different, and how much more agreeable, would have been the impression on the spectator.

How frequently again do we see the dimensions of a tall and *embonpoint* figure magnified to almost Brobdignagian proportions by a white dress, or a small woman reduced to Lilliputian size by a black dress ! Now as the optical effect of white is to enlarge objects, and that of black to diminish them, if the large woman had been dressed in black, and the small woman in white, the apparent size of each would have approached the ordinary stature, and the former would not have appeared a giantess, or the latter a dwarf.

It must be confessed that we English have always been more remarkable for our partiality to gay or glaring colors, than for our skill in adapting them to the person, or arranging them so as to be in harmony with each other.

If we look back to the history of British costume, we find this remark applies to our ancestors as well as to ourselves. Indeed, so much were certain colors esteemed formerly, that the aristocracy endeavored to establish a monopoly of them for their own use to the exclusion of the "city madam" and other less privileged persons. Scarlet, and crimson, and purple, were, in the opinion of our early legislators, fit to decorate the persons of nobles only, and many sumptuary laws were from time to time enacted —and as constantly evaded—with a view to restrict the use of these colors to the higher orders, and to restrain the taste

which successful mercantile transactions, and the effects of commercial intercourse with other countries, was everywhere diffusing, for extravagant personal decoration. Cloth of gold and silver, embroidery and jewels, silks and velvets, especially the imperial colors, scarlet, crimson and purple, were forbidden to be worn by persons of inferior station, on pain of forfeiture of the forbidden dress or ornament. It will easily be understood that as color was thus become an indication of the rank of the party wearing it, it was seldom adopted with any reference to harmonious arrangement. The dresses of the sovereigns, were however, as appears from contemporaneous records frequently elegant, and the colors well assorted. In the time of the early Plantagenets green was the favorite color; it was generally contrasted with red. Purple and green were also frequently worn together, and crimson was often lined with black or white. In the costume of persons of lower rank, however, we find the most extraordinary arrangements and combinations of colors. Merchants and serjeants-at-law are described as dressed "in motley" (parti-colored dresses); and Chaucer represents the parson as complaining of "the sinful costly array of clothing" of his contemporaries. Their hose, he says, "which are departed of two colors, white and red, white and blue, white and black, or black and red, make the wearer seem as though the fire of St. Anthony, or other such mischance, had cankered and consumed one half of their bodies." In the History of British Costume, by Mr. Planché (to whom we are indebted for much valuable information on this subject), mention is made of an illumination representing John of Gaunt sitting to decide the claims on the coronation of his nephew Richard II., dressed in a long robe divided exactly in half, one side being blue and the other white, the colors of the house of Lancaster. "The parti-colored hose," Mr. Planché observes, "renders uncertain the fellowship of the legs, and the common term *a pair* perfectly inadmissible." The dress of the ladies was characterized by similar extravagances. The same author tells us a writer of the thirteenth century compares the ladies of his day to peacocks and magpies; "for the pies," says he, "naturally bear feathers of various colors; so the ladies delight in strange habits and diversity of ornaments." In the reign of Edward III. ladies appeared at tournaments and public shows in parti-colored tunics, one-half being of one color, and the other half of another. At a later period (the reign of Henry VI.) the same strange taste for "motley" extended to the armor; the breast-plate being frequently covered with silk of one color, while the placard was covered with silk of another.

During the middle ages the best kinds of colored textile fabrics were imported frequently from Venice and Florence, both cities being then famous for their red dyes. The foreign manufacture of their articles of dress probably attached a value to garments of these colors beyond their actual worth; and for this reason, the privilege of wearing them was of itself a kind of distinction, and carried with it an appearance of rank and wealth. The colors worn as badges by political parties were also another source of the prevalence of motley colors. It has been before observed, that blue and white were the colors of the house of Lancaster; it may now be mentioned that murrey and blue were those of the house of York, and blue and scarlet those of England. These few instances are sufficient evidence that taste had, at the period of which we speak, little influence on the selection of colors. The fact that certain colors were worn by persons of high rank, or as a badge of party distinction, was sufficient reason for the adoption of the most incongruous arrangement of colors. Nor can we flatter ourselves that the national taste in regard to colors is, even in this age of refinement, materially improved. The sumptuary laws of which Sir Edward Coke in his Commentary on Littleton quaintly says, "Some of them fighting with, and cuffing one another," are now all repealed; there is no law to prevent men or women dressing, if they please, like harlequins. Colors have long ceased to indicate the rank of the party wearing them. Party politics, however, even now, occasionally dictate assortments and combinations of colors, totally at variance with each other, or destructive of all beauty of complexion. How frequently is the fair wife of a candidate for the honors of a seat in Parliament, with blue eyes and golden hair, obliged to appear in bright yellow or orange-colored

favors, because these are the colors adopted by her husband as those of his party, while the dark-browed lady of the rival candidate is seen in a dress of sky blue! We will venture to say that had the arrangement been reversed, the ladies would have secured more votes than they were likely to do in their discordant parti-colored dresses.

When political motives do not dictate what colors should be worn, there is frequently no other guide in their selection than fancy or caprice. To many persons the law of the harmony of colors is a sealed book. Were the principles more generally known, the agreeable effects would soon be perceptible in a better assortment of colors in relation to dress. It is hoped therefore that the following observations relative to the harmony of color as applied to dress, will prove acceptable to many readers of the *Art-Journal.*

In order, however, to render these remarks more generally useful, it will be necessary to explain briefly the principles of the harmony and contrast of colors.

It is now admitted that there are but three primitive colors—that is, three colors only which cannot be compounded of other colors: namely, red, blue, and yellow. With these three colors every hue and shade in nature (except white) may be imitated. With red, blue, and yellow, the painter can represent the rosy bloom of health, and the pallor of disease; the verdure and flowers which characterise the "leafy month of June," and the barren landscape of December, when

"The cherished fields
Put on their winter-robe of purest white."

It was formerly supposed that there were seven primitive colors, but Sir David Brewster has proved with regard to the colors of the prism—what has long been known to painters, with reference to the more material colors they employ,—namely, that three of the other colors are formed by the overlapping of the three primitives, and the seventh by the mixture of darkness or shade with the blue. In this manner the overlapping or blending of the red ray with the yellow produces orange, the overlapping of the yellow ray with the blue produces green, and the overlapping of the blue ray with the red ray produces violet or purple.

These three colors, orange, green, and violet or purple, are called *secondary* colors, because they are each composed of two primitives.

It will be seen that the space opposite to each of the primitives is filled by one of the secondaries composed of the other two primitives; red, for instance, is found to be exactly opposite to green, which is composed of blue and yellow; yellow is opposite to violet, which is composed of red and blue; and blue is opposite to orange, which is composed of red and yellow.

Now, it appears to be a law in the science (for so we must call it) of the harmonious contrast of colors, that when the attention of the eye has been directed steadily upon a color, (either primitive or secondary) there is a tendency in the organ to see the color which is directly opposite to it, whether it is actually present or not. If, for instance, a red wafer be placed on a sheet of white paper, and the eye is steadily fixed on it for some time, the red wafer will appear to be surrounded by a narrow and very pale circle of green, or if the eye, after looking attentively at a red wafer, be directed to another part of the paper, and the wafer withdrawn, a pale green image of the wafer will be perceived. Green, therefore, is said to be the *complementary* color to red, because the eye after looking fixedly at the red (one of the primitive colors) sees an image or spectrum composed of the other two primitive colors, which together make green. In the same manner the spectrum produced by blue is orange, and by yellow is purple. Nor is this phenomenon limited to the primitive colors only, it takes place also with regard to the secondaries, and even to what are called the broken colors; thus red is complementary to green, yellow to purple, and blue to orange. The colors thus opposed to each other are called complemental, or complementary, and sometimes compensating colors. In every case, these are the most beautiful and harmonious contrasts of colors.

It will readily be understood that the gradations of color between each of the primitives may be very numerous, by the mixture of more or less of the neighboring colors. The gradations are, in fact, so numerous, that it is impossible to name them all. Pure yellow, for instance, inclines neither to red nor blue, but if a small por-

tion of red be added to the yellow, we call it orange-yellow; if a little blue be added to the yellow, we call it greenish-yellow, if a little more blue it will pass into a yellow-green, thence to pure green, then to blue green, then greenish blue, to which succeeds pure blue and so on. The color which contrasts precisely with any one of these colors will be found exactly opposite to it in the circle. If, for example, it is required to find the complementary color of orange-yellow, we shall find opposite to it blue-purple, in the same manner we see that yellow-green is the complementary of purple-red and red-orange of blue green. By this arrangement an exact balance of the three primitives is preserved in all the contrasts, and the result is perfectly harmonious.

From the mixture in unequal proportions, of the three primitives, or of the secondaries with each other or with the primitives, other colors are formed which are variously termed tertiaries, quartiaries, and semi-neutrals, and to which various specific names are given; such as citrine, which may be composed of orange and green, olive, composed of purple and green, and russet, composed of orange and purple. To these may be added brown, slate, marrone, straw-color, salmon-color, and others of a similar nature, which, from the fact that all three of the primitives enter into their composition, may be denominated, in general terms, broken colors.

Harmony of color is of several kinds; it will be sufficient for our present purpose to allude to two kinds only, namely, *harmony of analogy*, and *harmony of contrast*. The term *harmony of analogy* is applied to that arrangement in which the colors succeed each other in the order in which they occur in the prism, and the eye is led in progressive steps, as it were, through three or more distinct colors, from yellow, through orange, to scarlet and deep red, or from yellow through green to blue, dark blue and black, or vice versâ. The same term is also applied to the succession of three or more different hues or shades of the same color. The *harmony of contrast* is applied to combinations of two or more colors, which are contrasted with each other, according to the laws of which we have spoken. In the first kind of harmony the effects are softer and more mellow, in the second more bold and striking.

Nature affords us examples of both kinds of harmony, but those of the harmony of analogy are most abundant. Of the more brilliant examples of the last kind of harmony, we may mention the beautiful succession of colors in the clouds at sunset or sunrise. Of a more sober kind is that which prevails in landscapes, where the blue color of the hills in the distance, changes as it advances towards the fore-ground through olive and every variety of cool and warm green to the sandy bank glowing with yellow, orange, or red ochreous hues at our feet. In both cases force, animation, and variety, are given by the occasional introduction of contrasts of colors. In the sky the golden color is contrasted with purple; the glowing red, or rose color, with pale green; the blue sky of the zenith and eastern hemisphere contrasts with the orange-colored clouds which are floating before it, with the peaks of snowy mountains, or the lofty towers of a cathedral standing out boldly against the clear blue sky, and reflecting on the sunlit crags or pinnacles the golden glories of the western hemisphere. On the earth the broken and variegated green and russet tints of the trees and herbage are vivified and brought to a focus, sometimes by the bright red garments of a traveler, sometimes by flowers of the same color scattered over the fore-ground.

For the sake of giving a more marked character to experiments on color, they are generally conducted with the primitives and secondaries, which in their pure state are called positive colors.

Of the three primitive colors, yellow is the lightest, red the most positive, and blue the coldest. Red and yellow, from their connexion with light and heat, are considered as warm colors; blue, from its association with the color of the sky and distant objects, is said to be a cool color. Of the secondaries orange is the warmest, green the medium, and violet the coldest. The warm colors are also considered as advancing colors because they appear to approach the eye, the cool colors are also called retiring colors from their appearing to recede from the eye. The contrast of green and red is the medium, and the ex-

treme contrast of hot and cold colors consists of blue, the coldest, with orange, the warmest of all colors.

Neither black nor white is considered as a color ; black may be formed by the mixture of the three primitives ; grey consists of an equal portion of black and white. When black is placed in contact with any color, it ceases to be neutral, and acquires by contrast a tinge of the compensating color; if, for example, a green dress is covered with black lace, the black assumes by contrast a reddish tint, which makes it appear rusty; for this reason the mixture of black and green is not pleasing. In the same manner small portions of white assume the complementary color of that to which they are opposed, but the general effect of a large mass of white is to make colors appear more vivid and forcible.

These fundamental principles of the harmony and contrast of colors being understood, we have next to consider their application to dress, and especially the effect of the different colors when in contact with the skin, in order to afford certain grounds for judging what colors may or may not be advantageously opposed to it. Articles of dress are too frequently purchased without any reference to their appropriateness in point of color to the individual who is to wear them. A momentary fancy, an old predilection, a party prejudice, will induce a lady to select a dress or bonnet of a color which not only does not increase the beauty of her complexion, but actually makes it worse than it really is. What, for instance, can be more unbecoming to a lady with a countenance of the color of parchment—we are putting this by way of example, not supposing that there ever was or ever will be a lady of this appearance—than a pale yellow dress or bonnet? If the color operates by the effect of contrast, her face will look blue, and how becoming soever blue may be for ladies' stockings, it is far otherwise when their complexion is tinged with it; every one knows that it is no compliment to a lady to say she looks *blue*. If reflexion has any influence, and not contrast, then will the face seem "fall'n into the sere and yellow leaf." Yellow is gay and lively everywhere but in the complexion, and then it reminds one of

"Jealousy suffused with jaundice in her eyes,
Discoloring all she viewed."

London Art-Journal.

AMERICAN ART-UNION.

BY J. K. FISHER.

SINCE our last, not much has occurred to indicate the probable fate of this cacocracy. The District-Attorney brought up his motion, in the Supreme Court, to confiscate the property, and deliver it to the Commissioners of the Almshouse. Judge Edwards, after having some discussion, advised the parties to agree upon the form in which they would present the case before the Supreme Court in general term, in May ; from whose decision either party may appeal to the Court of Last Resort,—a privilege they would not enjoy if the decision were given in the special term in which it was then pending. This suggestion was accepted ; and early in May there will probably be a decision The District Attorney announced that, should this decision be against the people, he would appeal to the Court of Appeals, which will sit in June. The counsel for the Art-Union said, that they were confident that the decision would be in their favor ; but, should it be otherwise, they probably would not appeal, but would petition the legislature to relieve them from the action of the law—that is, to restore to them their property ; and would also petition it to le-

galize their proceedings, as was done by Parliament in the case of the London Art-Union—which petition, they had no doubt, would be granted.

It will be recollected that, first, the Recorder quashed an indictment for libel, granted to the Art-Union against the Herald, on the ground that the Art-Union had violated the statute against lotteries; second, that Judge Oakley, of the Superior Court, issued a temporary injunction to restrain them from drawing, and ordering them to show cause why the injunction should not be permanent; third, Judge Duer of the same court declined giving an opinion on the main question whether the Art-Union is legal or not, but dissolved the injunction on the ground that if it be illegal the plaintiff, Bennett, is a participator in the crime, and therefore not entitled to redress; and, moreover, that the property belongs to the people, and cannot be in any manner disposed of by the Art-Union or the subscribers. Here we have two judges affirming its illegality by judicial decisions deeply affecting its interests; and a third judge declining to relieve it from the embarrassment and stigma which utterly prostrates its business—a course he could not have pursued unless it was out of his power to affirm its legality and restore its full liberty and standing. Upon all this, we have a Judge of the Supreme Court, in special term, fully empowered to give a decision from which there could be no appeal, sliding out of the case by advising the parties to agree upon some matters of form, and get a decision in general term, from which they could go up to the Court of Appeals for an irreversible decision. This postponement of two months leaves the Art-Union utterly incapable of getting subscribers, buying works, printing bulletins, and carrying on its general business; and, we think, no judge has any right to leave citizens or corporations in such embarrasement for so long a time, if he can at once relieve them, the fair inference is, that neither Duer nor Edwards *could* decide that the Art-Union is legal, and neither wished to give an adverse decision, which would render the managers personally liable for the debts of a concern that is probably bankrupt, besides the certainty that every subscriber may sue them for the recovery of his five dollars. It has been evidently the wish of the judges to shift the case upon others, in order that it might, if possible, reach some Judge who could decide in favor of the managers.

As to their chance of relief by the legislature from a confiscation for the benefit of the alms-house, it is not improbable that they may obtain it.

As to the chance of a legalization of their lottery, if it be a lottery within the meaning of the statute, the action of parliament upon the application of the London Art-Union affords not the least ground of hope; if it be a lottery within the meaning of the constitution, which declares that no lotteries shall be authorized, and that the legislature shall enact laws to prevent them Parliament is not restrained from authorizing lotteries—that is clear; but the legislature acts under a written constitution, made by persons who have as little respect for the liberties and rights of the individual as the king of Naples has; and these domineering oligarchs of a day have chosen to quash the liberty of selling property in this way; and the million tyrants have chosen to sanction this abominable oppression; and the Judges must necessarily enforce the unjust and tyrannical law of the insolent domineering rabble and their tools the constitution makers; or else give up their salaries, which they are not likely to do, and which would be for the present useless if they did it.

The most brilliant phase of this case is, that the quacks who manage and puff up that false pretending shop the Art-Union declare that none but themselves have a legal right to draw this kind of lottery: see their manifesto, in our May number for 1851. They declare that they would have stopped "one concern,"—Goupil & Co.—had it not been that their " motives would have been misconstrued." And they in effect tell all artists that if they get up " a mere lottery for pictures" they will drub them into subjection, by help of the strong arm of the law, and the strong walls of Sing-Sing. Why the timid artists have not hurled defiance in the teeth of those insolent oppressors is incomprehensible to us; we have only to say that the slightest intimation of this kind ought to be met with an instantaneous burst of indignant and uncompromising resentment from

every artist who is not a slave. They pretend that the public has set them up as the sole disposers of the immense patronage that may undoubtedly be amassed in the driblet way of lotteries ; and deny that the artists themselves have any right at all to sell their own works in this way ! Impudent braggarts whose shadow of power is a bugbear to make slaves of cowards !

But the necessities of a legal defence, and the cool advise of learned counsel, bring down these stilted bags of wind to the common level, or nearly so. The counsel announced in the Supreme Court, that they intended to make two points ; first, that their distribution is not a lottery in any sense, and never needed an authorization ; second, that it is authorized by their charter. For the first, we hope they may establish it ; for the second, we have a few words to say.

After boring the legislature many times with applications to tinker and amend their rigmarole charter, they went to it upon the ridiculous ostensible errand of getting permission to alter the time of holding their annual meeting ; and in wording that alteration, they slipped in the words, "when the distribution provided for in the constitution shall take place." These words, they say, authorize them to draw their lottery ; they say that their mode of distribution was well known to the legislators, and so on. This may be so : the legislators are mostly humbugs, and open to money, oysters, champagne, flattery, and even promises ; and we have no doubt that when well fed they would pass any ambiguous clause, that did not manifestly controvene the constitution : but if the nominees of pot-house intriguing wire pullers are ready to prostitute themselves in any way, does this at all palliate the conduct of men who pretend to be "gentlemen," and who assume authority over the affairs of a liberal art, when they go with a concealed purpose, and covertly obtain from mere political blacklegs an empty shadow of power with which to frighten into subjection a flock of timid sheepish artists. The Recorder decides that this "authorization" is void for uncertainty.

While the courts are slowly protracting this case, the managers are using all the influence they possess to operate upon public opinion. They have employed a lawyer of high reputation, who has recently distinguished himself by a brilliant triumph in the Forest divorce case, in order that the best possible view may be given to the public, and widely copied into papers all over the country ; and they have bribed the prostitute portion of the press by immense and uncalled for advertising patronage, and by paying a quarter of a dollar per line, for the printing of extra judicial opinions ; and they have assiduously used their personal influence with others who would not be bribed, to prevent them from publishing any arguments from those artists and friends of art who have for the last two years, set the insolent oligarchy at defiance, and probably done much by their writings, to erase the follies of from nineteen to twelve thousand in two years. It is believed that enormous sums have been squandered in thus shutting up the press against the opposition, and obtaining a little of its faint, trashy, worthless and utterly ineffective praise, for the pompous directors.

But the days of this stilted oligarchy are evidently numbered. If the courts and the legislature both sustain it, and the prostitute press absorb a fifth of its income for puffs and advertisements, the public cannot be gulled much longer. Its trashy prints have settled the question for it ; and the whole force of its eight hundred "honorary" secretaries, with their fifteen per cent commission, and "expenses allowed," can not drum up more than half the number for next year that have been victimised this year. And, if the prints were not enough to disgust even the rudest tastes, the intolerably stupid bulletin has been given away by cart-loads and mail-loads : whoever has read much of that will not be likely to subscribe. In fact, few subscribers have been obtained for the last few years except among those who knew nothing of the concern but what they read in the papers under its pay. And when it is finally wound up, everybody will wonder how such a rank humbug could have flourished so vigorously and so long.

GOSSIP.

So, you keep writing away at us poor daguerreotypists, who do not subscribe for the Journal as ignoramuses in the art, said one to us.

"You are mistaken," we replied, "we do not consider any one an ignoramus because he does not take the Journal. A man is at perfect liberty to do as he pleases in that matter and so long as he does good work and is intelligent, studying the various phases of his art we shall not quarrel with him because he does not take the Journal. Undoubtedly we should be pleased to receive his support, but we shall never censure him. We war only with those who being ignorant themselves, and miserable operators, set themselves up as umpires between practical and theoretical experience—those who term written knowledge a humbug, and scientific works nonsense, as some daguerreotypists who figure largely on self-puffery in our daily papers in different parts of the country, open large galleries with fine furniture and yet are unable to take more than passable pictures. We have as often spoken favorably of daguerreotypists who were not our subscribers as those who were. It is the narrow minded philosophy of those who deride what they are pleased to term 'book knowledge' against which we war. We desire to convince all that this kind of knowledge is as necessary to sustain the health of the mind as food is that of the body, and it can only be obtained by attentive study. The fact is the larger portion of those daguerreotypists who decry theoretical knowledge are either too lazy to devote two or three hours a day—an amount of time they all have at their disposal—or they prefer spending the money that would enable them to obtain it in the billiard room, the drinking house, or upon women. This we know to be a matter of fact in many instances. Without the ambition to raise them above the common horde, they plod along in grovelling ignorance of every thing pertaining to their art except a mere mechanical process that enables them to get a shadow they call a daguerreotype.

"Let us ask, who are the men in—we will take—New York, who are the most celebrated, and justly so, for producing fine pictures? Are they not Brady, Lawrence, Hass, A. Morand, Gurney, Beckers, Harrison, Piard, Mead, and Root? and who will, even among daguerreotypists, question their reputation and excellence? They have all risen to the height of their art by those regular gradations in the ascent of Fame's ladder necessarily pertaining to every profession. Have they accomplished it by confining themselves to the mere mechanical manipulation of the art? Not at all: they have seized upon every improvement, every suggestion of improvement, that has come within their reach; sifted the flour from the chaff, and are consequently filling their garners with a golden harvest, while those who have egotistically and entirely thrown themselves upon their own resources—considering that, with the ability to half clean and coat a plate, they know enough—either eke out a bare existence over the buff stick and coating boxes, or resort to questionable, not to say dishonest, means of instruction, or the petty peddling of daguerreotype material to make up the small pittance necessa

ry to their support. I ask you as a daguerreotypist, is not this true?"

"Well, I must acknowledge it. But how can it be remedied. There always will be such men in every business."

"That is very true, and unfortunately it cannot be entirely prevented; but in this case the evil can be cured in a great measure if the proper remedies are applied. The daguerreotype art is precisely in the same category with medicine—quacks will creep in, but by applying similar checks not only an increase can be prevented, but the present number greatly reduced.

"These checks are a more intimate knowledge of the art upon the part of the intelligent portion of daguerreotypists, well organized associations on the same plan as our medical societies, and a determination not to teach the process at prices so low that every boot-black may learn it if he chooses.

"Many operators advertise to teach the art and furnish a *complete outfit* for from twenty-five to thirty dollars. Now this cannot be done honestly, and they receive any thing for their trouble."

"There is no doubt these abuses can be prevented by well organized societies, but in no other way.

It is no wonder to us that daguerreotyping is looked upon, by a large number of intelligent persons, as an inferior business, for there are so many engaged in it who are so perfectly ignorant of the first principles of art that they can with difficulty discriminate between the drawings of a pig and a sheep, to say nothing of art itself, as of that they are *perfectly* ignorant. We have been frequently shown plates that were supposed to contain daguerreotypes, and asked if we did not consider them equal to any we had ever seen, when in fact they could only remind us of our infant attempts at portraiture, when for a face we made a circle, containing three simple dots for the eyes and nose, and a half moon stroke for the mouth. We will venture to say, that ninety-nine hundredths of the daguerreotypes taken by the class to whom we allude, are nothing more than the primitive drawings of childhood. The plates are badly cleaned, buffed and coated, and then left in the camera until every particle of shadow is destroyed, except the extreme darks, and at times even the outlines so faint that they are barely perceptible, and these are called daguerreotypes; heaven save the mark! what should we call abortions?

At times, the productions of these men, who have the assurance to place upon their signs, "Daguerreotype *Artist*," look as if they had been intended to represent the small pox in its worst stages; at others as if they had been plunged into a meal bag; and again as if they had received an indigo bath, and yet these men will tell you that there are no more improvements to be made in the daguerreotype, and that experiments and theory are "humbug."

For such men to attempt to color their productions! ask them, and they will tell you carmine is flesh color, that light red is a dirty, nasty color; that burnt sienna and umber make the face look black; that purple is blue and ruby purple; that scarlet is crimson, and crimson scarlet; in fact they know less about colors than they do about the quality of a daguerreotype, and of that they know nothing.

It is such men as these who degrade the art, who cause the intelligent men almost to despise it, and who usurp the places of more deserving candidates who would otherwise embrace it as their profession.

— It will be noticed that we have presented our readers with a greater variety of art matter in this number than in any preceeding. We have done this—and shall

hereafter continue to do so—at the request of a large portion of our subscribers, who seem to desire greater insight into other branches of art—particularly those most intimately connected with their own. This desire we specially commend, and we should —had we followed the bent of our own inclination—have adopted this course sooner had we not thought that our patrons would object to such an encroachment upon what they might consider their exclusive domain of art. There is no denying the fact, that, in order to be a perfect daguerreotypist, the artist must understand the principles of art generally. Without this knowledge their pictures must of necessity prove faulty in some one point, either in perspective, position, outline, tone or shading. In position and outline alone nine-tenths of all daguerreotypes produced are imperfect, and as for tone, perspective and shading, imperfections are numberless. Coloring we deprecate altogether.

— The following most gratifying intelligence we clip from the *New York Tribune*.

American Artists in Rome.—Thurlow Weed writes from Rome as follows:

We have visited the studios of Freeman and Terry, American painters, who have been long enough in Rome to establish a high Italian reputation. With Mr. Freeman's success I am much gratified, for he is professionally and personally a man of decided worth. As an artist he aimed high, but by long and devoted study and labor he has attained his mark. He goes home in May, taking with him two large pictures (both of which are sold) which have been greatly admired here, and will assuredly extend and perpetuate his fame. Mr. Terry has been eminently successful here. Like Freeman he only paints original pictures. For his best picture (Jacob's Dream) he has orders that will require several years to execute. Mr. Chapman, another American painter, is devoting himself successfully to his art. His studio is adorned with several beautiful heads, either finished or in progress. He is also making a copy of Murillo's Mother and Child.

We went, of course, to the studio of the sculptor Crawford, whose colossal statues of Patrick Henry and Thomas Jefferson, ordered by the Legislature of Virginia to grace a monument at Richmond, are exciting universal admiration. They are indeed noble conceptions and noble creations, worthy in all respects of the illustrious Statesmen whose forms and fame they are destined to perpetuate. These figures, together with an equestrian statue of Washington, are to be cast in bronze at Munich.

Mr. Story of Boston, son of the late eminent Justice Story, is here working upon a model for a statue of his father.

Mr. Mosher, of New York, a sculptor of decided genius, is rising, like most of the American artists here, to usefulness and fame. Mr. Wood, another sculptor, has just finished an excellent marble bust of our townsman, Mr. De Witt, who will avail himself of his vist to Europe to gather up a good many gems.

I am gratified to see that our Artists here are profitting handsomely by the taste and liberality of wealthy Americans who have been in Italy during the present year. —It is quite time that more should be done, in this way, to embellish both our public edifices and private mansions. Our country is rich enough now to indulge in this commendable luxury, and a visit to Italy cannot fail to beget and cultivate a taste for Art.

The English and American families here have beguiled the winter with private theatricals, under the especial auspices of Mr. and Mrs. Black, at whose mansion we saw the "Merchant of Venice" played with much dramatic spirit and effect the other evening.—Among the *Dramatis Personæ* were Mr. and Mrs. Story, Mr. John G. Lowell and Mr. and Mrs. Crawford, and a Mr. Hemans, son of the gifted Authoress.

I have seen the works of Gibson, the best English Sculptor, and those of Powers and Crawford, the best American workers in marble. Than these three Artists, there are none in Italy of higher, if of equal merit. And yet, sublime and beautiful as are the creations of these men, there is an

American, now comparatively unknown, who is destined to equal if not surpass them all. This is our townsman, Palmer, who needs only a course of study and practice here, with the works of the masters before him to take rank among the most distinguished Sculptors of the age.

— Our daguerreotypists have been unusually quiet during the past month, which we attribute to the improvement in the business throughout the whole country.

Mr. Brady has returned from Europe in renewed health and with a rich budget to open for the benefit of his friends.

Mr. Philip Morand has opened a very handsome suit of rooms on Broadway near Spring street. His specimens are good, and we do not see why he should not do well in the central location he has chosen.

Mr. Gabriel Harrison has opened an elegant gallery on Fulton Street Brooklyn. These rooms are decorated and furnished in a style superior to any other we have seen, and the well known ability of Mr. Harrison as an artist, both as painter and daguerreotyper will undoubtedly secure to him a most liberal share of the public favor. Mr. Harrison's rooms will bear description, and we insert the following for the benefit of those who wish to follow his tasteful and artist like example.

The Whitehouse Buildings, just finished, are said to be the finest ever erected in Brooklyn. The entrance is ten feet wide, with the Gallery and Operating Room all on the second floor; doors of brilliant stained glass; size of the Exhibition Room, forty-five feet long, twenty-five feet wide, and fourteen feet high, octagon in form, and elegantly painted in fresco, with Crocus Martis tint, white and gold, Elizabethian in design, and the whole lighted with a large oblong skylight of ground glass, thereby producing a light of such softness that Daguerreotypes, and other works of Arts, can be looked at with a degree of pleasure hitherto not afforded in like establishments.

THE OPERATING ROOM.—Is fifty feet long, thirty feet wide, and frescoed in a quiet, subdued tint, which is of great importance to the producing of a first rate Daguerreotype, as thereby we have no reflected lights to destroy the quality, roundness and strength of shadows, it also preserves the natural sharpness of the *eyes*, as but one light will be observed on the *Iris*, instead of half a dozen—as is the case in most Daguerreotypes, from the effect of harsh white walls, &c. &c.

THE LIGHT.—Under which the sitters are placed to have their portraits taken, is the largest in the world, and contains over *two hundred and fifty square feet* of the best English white plate glass, faces about North-East, angle of thirty-five degrees—the best position for a light to prevent abrupt shadows under the eyes, nose and chin, and has a tendency to produce miniatures of such softness and roundness of flesh that they must become at once the favorites with all persons of refined and artistic taste.

THE LADIES DRESSING-ROOM.—Is contiguous to the Operating Room; is fifteen feet square, and fitted up in the most chaste and beautiful style with salmon color and marble top furniture. Toilet always kept in order, and of the first quality.

— Mr. E. C. Thompson has established himself in a fine gallery in Washington, where he is doing an excellent business and giving excellent satisfaction. He is undoubtedly the best operator in that city.

— We regret to announce that Mr. Gurney of New York is lying very low, from the effects of the mercury used in his art, and fears are entertained for his life. Mr. Gurney's is the fourth case of this nature that has come under our observation within the last two years, and they show the necessity of extreme caution in the management of the mercury bath. We shall suggest a plan in our next that we hope will be effectual in preventing this poisonous effect of mercury.

— Mr. D. D. T. Davie has opened a fine suit of rooms in Syracuse, N. Y., which will be under the charge of his brother, J. Davie, a young operator of ex-

cellent skill and judgment. With Messrs Clark, and Geer & Benedict, Syracuse can now boast of three of the best daguerreotypists in the state. Mr. D. D. T. Davie still remains in Utica.

THE REBUBLIC ; MONTHLY MAGAZINE. —Thomas R. Whitney, *Editor*. This valuable American monthly has been much improved in size and style since our last notice, and as it is the only truly American magazine published in this country, we consider it the duty of every patriot to subscribe for it.

The savans and photographers of England are following the example of our American daguerreotypists, and propositions are being made in their periodical press for the organization of a Photographic Society upon the following basis. It will be perceived that it resembles in almost every point that upon which the N. Y. State Association is founded. We are most happy to hear of this movement, for it will, we doubt not, as it should, give greater stability to our own. The photographers in this country, that is those who are known at all, are acknowledged to surpass those of Europe in the manipulatory department of their art, and we sincerely trust they will not allow their trans-Atlantic brethren to excell them in respect to the usefulness and ability of associated research and knowledge.

"The science of Photography, gradually progressing for several years, seems to have advanced at a more rapid pace during and since the Exposition of 1851. Its lovers and students in all parts of Europe, were brought into more immediate and frequent communication.

"Ideas of theory and methods of practice were interchanged: the pleasure and the instruction were mutual. In order that this temporary, may become the normal condition of the art and of its professors, it is proposed to unite in a common society, with a fixed place of meeting, and a regular official organization, all those gentlemen whose tastes have led them to the cultivation of this branch of natural science.

"As the object proposed is not only to form a pleasant and convenient Photographic Club, but a society that shall be as advantageous for the art as is the Geographic Society to the advancement of knowledge in its department, it follows necessarily that it shall include among its members men of all ranks of life; that while men of eminence from their fortune, social position, or scientific reputation, are welcomed, no photographer of respectability in his particular sphere of life, be rejected.

"The society then will consist of those eminent in the study of natural philosophy of opticians, chemists, artists, and practical photographers, professional and amateur. It will admit both town and country members.

"It is proposed:—

"That, after the society is organized, persons who may in future wish to become members will have to be proposed and seconded, a majority of votes deciding their election

"That the entrance fee and subscription shall be as small as possible, in order that none may be excluded by the narrowness of their means.

"That the society shall have appropriate premises fitted up with laboratory, glass operating room, and saloon, in which to hold its meetings.

"That such meetings should be periodically held, for the purpose of hearing and discussing written or verbal communications on the subject of photography, receiving and verifying claims as to priority of invention, exhibiting and comparing pictures produced by different applications of photographic principles, making known improvements in construction of cameras and lenses, and, in fine, promoting by emulation and comparison the progress of art.

"That the proceedings of the society shall be published regularly in some acknowledged organ, which shall be sent to all subscribing members.

"That a library of works bearing upon

the history, or tending to the elucidation of the principles of the science, be formed upon the premises and at the expense of the society, to be used by the members, subject to such rules as may hereafter be agreed upon."

— HUMPHREY'S JOURNAL: *Published semi-monthly, at* $1,00 *a year:* S. D. HUMPHREY publisher. This is a new candidate for the patronage of the public. It is a handsomely printed sheet of thirty-two pages, and is edited with Mr. Humphrey's usual ability. Mr. Humphrey informs us that he has been obliged to issue this periodical in consequence of the disagreeable position in which he has been placed by the sale of the Daguerrean Journal; of which more anon.

— LA LUMIERE holds the following language in regard to the article we published, from the Plattsville paper, on the Hillotype. We copy it to show the feeling prevailing in Europe concerning this matter, and to convince Mr. Hill that every day added to the delay in producing perfect specimens of his alledged discovery only serves to sink him deeper in the bad opinion of his fellow men. This opinion is not confined to Europe, but is as general here. More so than he is probably aware of. Another point which fixes unfavorable impressions in regard to the discovery is, that notwithstanding his written assertions that the interests of *all respectable* daguerreotypists should be consulted in the distribution of the rights to use the discovery, he is now negotiating with many who have no claims of this kind for the sale of town and city rights, while such men as Brady, Haas, Gurney, Whipple, McClees, and others, of our very first operators, are apparently discarded. Another reason unfavorable to Mr. Hill is the assertion of the men who claim to have secured rights, that these rights give them the *exclusive* use of the invention for the town or city in which they are located; which, if true, at once stamps falsehood upon the written words of Mr. Hill himself. La Lumiere says:—

"What bad spirits could have inspired all the wicked things we have written lately about the Rev. Mr. Hill? God help us! We have attached without pity the name of buffoon and a crowd of other epithets as malevolent to the rival of Franklin, Fulton, &c; we have treated irreverently a benefactor of mankind, and we now confess it, that it is now cried aloud by all the world that we are the enemies of the holy man;—for most assuredly he is a holy man, and we should have been convinced of this before by the pious style of his letters, and it is now clear to us that all the money that he will make with so laudable a perseverance and such great skill will be undoubtedly devoted to works of benevolence. It is not he, but it is the poor of New York who will reap the benefit of 200,000 francs secured by the sale of six editions of his book; and we have dared to reproach him!

"This is the conclusion (or the language) our clear seeing editor should have held after reading that portion of the article of which we have given the translation; the remainder is a repetition of what has already been said.

"Now, when he issues a prospectus for a sixth edition of his book we will be better able to applaud, for it will be required to solace humanity! We will say, however, that the last phrase—so edifying—of the article in question, (from the *Plattsville Advocate*,) and which has appeared in all the prospectuses and letters of the Rev. gentleman, induces us to believe that Mr. Hill himself is the author of it. What remarkable philanthrophy! Dare then, still to demand proofs of his discovery!

"EARNEST LACAN."

N. Y. STATE DAGUERREAN ASSOCIATION.—At the last moment we received the following communications. The proceedings will be published in our next:

Rochester, May 5, 1852.

MR. H. H SNELLING—Dear Sir: Your communications came duly to hand. There

was a respectable attendance of the members at the meeting, and a general good feeling prevailed We received four new members. Mr. McDonell, of Buffalo, presented the society with a double whole plate view of Buffalo, which was pronounced by all present to surpass any thing they ever saw.

The society renewed their request for each member to furnish a specimen of their work and forward it to Utica, to Davie, in time for the State Fair, to be exhibited as the property of the Society.

Yours in haste,

C. B. Denny.

Please send me some copies of the constitution. You will get a further description hereafter.

D. D. T. Davie appointed Treasurer.
G. M. Barnard, " Secretary.

Utica, May 9th, 1851.

Mr. H. H. Snelling—Dear Sir: It may not be amiss for me to give you a brief sketch of the last meeting of the N. Y. S. D. Association, held at Rochester, on Tuesday last. It was much regretted by all present that yourself, Mr. Morand, and others, were absent; but, notwithstanding, the meeting was a spirited one. After transacting the usual business of the society, there was a free interchange of views by all present upon the various processes of manipulation, and upon the whole I must say that a more devoted and energetic band of researchers I never met. Five more were added to our number on that day, all of whom are promising looking young men, and I doubt not they are now on their way rejoicing. Prospects are good. Since the last meeting of the Society I have taken new courage, for I feel that the battle is nearly won. I believe that at the next meeting, which is to be held in your city, there will be a large attendance, and many will join our number. I see no reasons for holding back, but on the contrary. Should all good practical daguerreans come up to the work and show as much cheerfulness in giving as they do in receiving, it would be but a short time before the Association would stand high among the scientific Associations of our country.

Before I close I will give you, in as few words as possible, the substance of an interview which I had with an *artistic* sort of a gentleman at Syracuse, who I attempted to urge to go with me to the meeting. It is not necessary that I call names. I will add that were he by profession what he is by name, the fine arts would certainly loose nothing by his exit, and how much strength would be added to the pettifogging fraternity, I will leave wiser heads than myself to determine. I will not tax your patience with a minute description of the professor's person. That he is good looking and all that sort of thing, no one will doubt. As I entered his room I saw that he was very busy in attempting to secure the likeness of a gentleman, and I did not interrupt him. Soon, however, the professional gentleman appeared, calling on his brother for his watch to time his sitting. His brother kindly passed his watch over, but on examination it did not run. The professor hit it a knock, and still it would not go. All this time the picture was working. I drew my watch from my pocket, and remarked that I would call off the time. I began by fifteen seconds and called to one and three-quarter minutes, making in all, at least two and-a-half minutes time in the camera, with an intense light, and as bright a sun as ever shone. The picture was soon mercurialized, and passed to the gentleman for his approval; but the gentleman said that, after sitting nine times, he was sorry to say that he was not suited. By this time the young gentleman's father entered the room and informed him that the packet was about to leave the dock, and he must go immediately. The professor remarked "that he was sorry for their mutual benefit, more particularly his own. But," said he, "it is gone to ——."

After the excitement of this occurrence had passed, I invited the professor to attend the meeting at Rochester. "No," said he, "your meetings are all a humbug, your associations are a humbug, and your journals are still a greater humbug. What," says he, "is the use of associations, as long as knowledge in making pictures is universal, while one man knows as much about the business as any man in America, there is no use of Societies. I ask no odds of any live man. I have been a practical daguerrean eight years, and have been through the mill. I'll give G. & B. fits." After listening to the hisses of the serpent, I left his den, not, however, without a sli ht touch of his slanderous or poisoning tongue. I cannot find language to express my feeling as I left that place. My soul sank within me, and I could have blamed our Creator for allowing the pure and holy light of Heaven to act in unison in any degree with so nasty and unskillful a manipulator, then, again, I knew that God "rained on the just and on the unjust."

After a short description of his advertisements,—news paper circular, I will close my tedious letter. As nearly as I can recollect it runs thus: "Mechanics leave your benches and your plough's, come one and all to———Daguerrean gallery. I have just purchased ten thousand dollars worth of stock at sheriff's sale, and can sell best quality *papier mache* cases 1-6 size, such as cost $4 the world over, at $1 50, including likeness, and all the various sizes at corresponding prices. I must close my letter leaving you to draw such conclusion as your judgment may dictate.

I remain your sincere friend and well wisher. D D. T. DAVIE.

Oswego, May 5th, 1852.

FRIEND SNELLING:—There not being any of the N. Y. Daguerreans present at our meeting in Rochester yesterday, I hasten to give you a short notice of that gathering. Although there were few in number, it was one of the best meetings we have ever had, deprived as we were of the books and papers belonging to the association, from the neglect of those having them in charge to forward them on in time. We had nothing but the minutes of the last meeting to work from. We did the best we could under the circumstances. I will send you the minutes in a few days, as I can get time to put them in shape. I said we had a good time, and so we did; every member present felt himself perfectly at home—a freedom which I have never before seen exhibited in our fraternity.

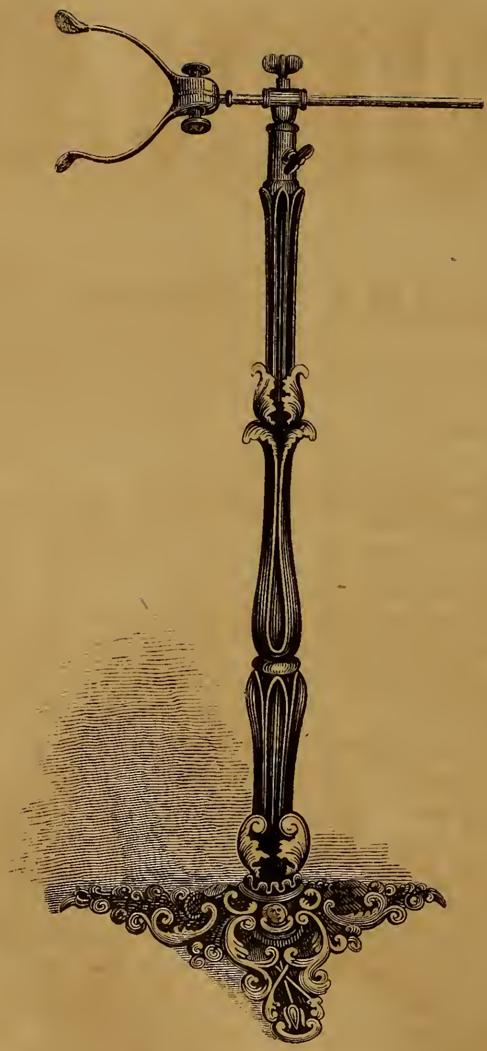
All regretted your absence, also that of our President, Mr. Morand. We received a letter from him stating that he was detained at home from sickness of himself and family.

Every member present has pledged himself to furnish an original picture in the course of the summer, and send it to Utica, that being a central point, where they will be kept for the present. They will undoubtedly be exhibited at our STATE FAIR next fall. Mr. McDonald brought one double whole plate, a view of Buffalo, one of the finest pictures I have ever seen.

Our association is bound to flourish, but I regret your N. Y. operators take so little interest in it. We are coming among you once more, and I trust we shall have a full attendance from the city daguerreans.

Quite a number of operators joined our association yesterday and are determined to throw in their mite in keeping the ball moving; how much good might be done if every operator would feel enough interest in associations of this kind to become members and spend one or two days in the year meeting together and exchanging ideas, bringing in notes of their discoveries, &c., but I must bring this hasty written letter to a close, and will send you the proceedings in a few days.

Yours Respectfully,
GEO. N. BARNARD.



ALLEN'S UNION HEAD-REST

Engraved for Photographic Art-Journal

THE

PHOTOGRAPHIC ART-JOURNAL.

Vol. 3. JUNE, 1852. No. 6.

PHOTOGRAPHY.

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AUTHOR OF
"RESEARCHES ON LIGHT," "THE POETRY OF SCIENCE," ETC.

CHAPTER I.

EARLY HISTORY OF PHOTOGRAPHY.

IT is instructive to trace the progress of a discovery, from the first indication of the truth, to the period of its full development, and of its application to purposes of ornament or utility. The progress of discovery is ordinarily a slow process, and it often happens that a great fact is allowed to lie dormant for years, or for ages, which, when eventually revived, is found to render a fine interpretation of some of Nature's harmonious phenomena, and to minister to the wants or the pleasures of existence. Photography is peculiarly illustrative of this position.

The philosophers of antiquity appear to have had their attention excited by many of the more striking characters of light. Yet we have no account of their having observed any of its chemical influences, although its action on colored bodies—deepening their color in some cases, and discharging it in others—must have been of every-day occurrence. The only facts which they have recorded, are, that some precious stones, particularly the amethyst and the opal, lost their sparkle by prolonged exposure to the rays of the sun.

It has been stated—but on doubtful authority—that the jugglers of India were for many ages in possession of a secret process, by which they were enabled in a brief space to copy the profile of any individual, by the action of light. However this may have been, it does not appear that they know anything of such a process in the present day.

The alchemists, amidst the multiplicity of their manipulatory processes, in their vain search for the *philosopher's stone* and the *elixir vitæ*, stumbled upon a peculiar combination of silver with chlorine—an element unknown to them—which they called horn silver—as, by fusion, the white powder they obtained by precipitation was converted into a horn-like substance. They observed that this horn silver was blackened by light, and as they taught that "silver only differed from gold in being mercury interpenetrated by the sulphureous principle of the sun's rays," they concluded that this change was the commencement of the process by which their dreams were to be realised. Failing, however, to produce gold from horn silver, the fact of its blackening was simply recorded, and no further investigations were made into this remarkable phenomenon.

The illustrious Scheele, in his admirable *Traite de l' Air et du Feu*, gave us the first philosophical examination of this peculiar change in the salts of silver, and showed the dissimilar powers of the different rays of light in effecting this change. In 1801, Ritter proved the existence of rays a considerable distance beyond the visible spectrum, which had the property

of speedily blackening chloride of silver. These researches excited the attention of the scientific world: M. Berard, Seebeck, Berthollet, and others, directed their attention to the peculiar condition of the different rays in relation to their luminous and chemical influences; while Sir William Herschel and Sir Henry Englefield investigated the calorific powers of the colored rays, and were followed in these investigations by Seebeck and Wunsch. Dr. Wollaston pursued and published an interesting series of experiments on the decomposition effected by light on gum guaiacum. He found that paper washed with a solution of this gum in spirits of wine, had its yellow color rapidly changed to green by the violet rays, while the red rays had the property of restoring the yellow hue. Sir Humphry Davy observed, that the puce-colored oxide of lead became, when moistened, red, by exposure to the red ray, and black when exposed to the violet ray; that hydrogen and chlorine entered into combination more rapidly in the red than in the violet rays, and that the green oxide of mercury, although not changed by the most refrangible rays, speedily became red in the least refrangible.

The revival of gold and silver from their oxides, by the action of the sun's light, also occupied the attention of Count Rumford, who communicated two papers on this subject to the Royal Society. These, and some curious observations by Morichini and Configliachi, M. Berard and Mrs. Somerville, on the power of the violet rays to induce magnetism in steel needles, are the principal points of discovery in this branch of science, previously to the announcement of the Daguerreotype. Seebeck and Berzelius investigated this involved subject: it has again and again engaged the attention of experimentalists; but to the present time it may be regarded as an unsettled point, whether magnetism can be induced in steel by the solar rays.

A statement has been made by the French, to the effect that M. Charles was in possession of a process by which portraits could be obtained by the agency of sunlight, producing a dark impression upon a prepared surface. This is, however, exceedingly doubtful, and even the Abbe Moyno in his Repertoire states, that M. Charles never disclosed any fact connected with his hypothetical discovery, and that he left no evidence behind him of ever being in possession of such a secret process: we may therefore fairly infer that this is a vain boast. The earliest recorded attempts at fixing images by the chemical influence of light, are those of Wedgwood and Davy, published in the Journal of the Royal Institution of Great Britain, in June, 1802. Neither of these eminent philosophers succeeded in producing a preparation of sufficient sensitiveness to receive any impression from the subdued light of the camera obscura. By the solar microscope, when the prepared paper was placed very near the lens, Sir H. Davy procured a faint image of the object therein; but being unacquainted with any method of preventing the further action of light on the picture, which is, of course, necessary to secure the impression, the pursuit of the subject was abandoned. From this period no attempt was made to overcome the difficulties which stopped the progress of Davy, until 1814, when M. Niepce, of Chalons, on the Soane, appears to have first directed his attention to the production of pictures by light.

It does not seem his early attempts were very successful ones; and after pursuing the subject alone for ten years, he, from an accidental disclosure, became acquainted with M. Daguerre, who had been for some time endeavoring, by various chemical processes, to fix the images obtained with the camera obscura. In December, 1829, a deed of copartnery was executed between M. Niepce and M. Daguerre, for mutually investigating the subject.

M. Niepce had named his discovery Heliography.* In 1827, he presented a paper to the Royal Society of London, on the subject; but as he kept his process a secret, it could not, agreeably with one of their laws, be received by that body. This memoir was accompanied with several designs on metal, which were afterwards distributed in the collections of the curious, some of them still existing in the possession of Mr. Robert Brown, of the British Museum. They prove M. Niepce to have

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* Sun-drawing; a more appropriate name than Photography, since there are reasons for believing that *light* is not the agent producing those so-called "light drawn" pictures.

been then acquainted with a method of forming pictures, by which the lights, semi-tints, and shadows, were represented as in nature; and he had also succeeded in rendering his *Heliographs*, when once formed, impervious to the further effects of the solar rays. Some of these specimens appear in the state of advanced etchings; but this was accomplished by a process similar to that pursued in common etchings, to be hereafter explained. Glass, copper plated with silver, and well planished tin plate, were the substances on which M. Niepce spread his sensitive preparations. Paper impregnated with the chloride or the nitrate of silver was the material first selected by M. Daguerre. Heliography does not appear at any time to have produced very delicate effects. The want of sensibility in the preparation,—the resin of some essential oils, particularly the oil of Lavender, or asphaltum dissolved in spirit,—rendered it necessary that the prepared plate should be exposed to luminous influence from seven to twelve hours. During so protracted an interval, the shadows passed from the left to the right objects, and consequently all the fine effects arising from the contrasts of light and shade are destroyed. The first attempts of Daguerre appear to have been little more successful than those of Wedgwood.

The discovery of Daguerre was reported to the world early in January, 1839; but the process by which his beautiful pictures were produced was not made known until the July following, after a bill was passed, securing to himself a pension for life of 6,000 francs, and to M. Isidore Niepce, the son of M. Niepce above mentioned, a pension for life of 4,000 francs, with one half in reversion to their widows. It is to be regretted, that after the French Government had thus liberally purchased the secret of the process of the Daguerreotype, for "*the glory of endowing the world of science and of art with one of the most surprising discoveries that honor their native land*," on the argument that "*the invention did not admit of being secured by patent, for as soon as published all might avail themselves of its advantages*," that it should have been guarded by a patent right in England.

On the 31st of January, 1839, six months prior to the publication of M. Daguerre's process, Mr. Fox Talbot communicated to the Royal Society his photographic discoveries, and in February he gave to the world an account of the process he had devised for preparing a sensitive paper for photographic drawings. In the memoir read before the Royal Society, he states—"In the spring of 1834, I began to put in practice a method which I had devised some time previously, for employing, to purposes of utility, the very curious property which has been long known to chemists to be possessed by the nitrate of silver, namely, its discoloration when exposed to the violet rays of light." From this it appears that the English philosopher had pursued his researches ignorant of what had been done by others on the continent. It is not necessary to enlarge, in this place on the merits of the two discoveries of Talbot and Daguerre; but it may be as well to show the kind of sensitiveness to which Mr. Talbot had arrived at this early period, in his preparations; which will be best done by a brief extract from his own communication.

"It is so natural," says this experimentalist, "to associate the idea of *labor* with great complexity and elaborate detail of execution, that one is more struck at seeing the thousand florets of an *Agrostis* depicted with all its capillary branchlets, (and so accurately, that none of all this multitude shall want its little bivalve calyx, requiring to be examined through a lens), than one is by the picture of the large and simple leaf of an oak or a chesnut. But in truth the difficulty is in both cases the same. The one of these takes no more time to execute than the other; for the object which would take the most skillful artist days or weeks of labor to trace or to copy, is effected by the boundless powers of natural chemistry in the space of a few seconds." And again, "to give some more definite idea of the rapidity of the process, I will state, that after various trials, the nearest valuation which I could make of the time necessary for obtaining the picture of an object, so as to have pretty distinct outlines, when I employed the full sunshine, was *half a second*." This is to be understood of the paper then used by Mr. Talbot for taking copies of objects by means of the solar microscope.

From this period the progress of photo-

graphy has been rapid. Sir John Herschel has devised many extremely ingenious and useful methods for preparing and fixing the drawings; and the curious scientific results which he has obtained, whilst studying the peculiar functions of the different rays of light, and of the various photographic materials which he has employed, are of the highest importance. It were useless to enumerate all who have by their experiments produced practical improvements in the art; particularly as these will be noticed under the different sections to which their discoveries properly belong. The processes on paper, as well as those on metallic plates, have been improved, until it appears that the highest degree of sensibility has been produced of which any chemical compounds are susceptible. We have only now to study the means by which facilities may be given to the mechanical arrangements, and the best optical conditions obtained, to render the photographic art at once as perfect as its results are beautiful.

CHAPTER II.

GENERAL REMARKS ON THE SOLAR AGENCY PRODUCING CHEMICAL CHANGE.

The use of the paper as the material upon which the coating that is to undergo a chemical change by exposure to solar radiations should be spread, claims our earliest attention on several accounts. Wedgwood and Davy employed paper and white leather in their earliest experiments; and Mr. Talbot's results obtained also on paper, claim priority, as far as publication is concerned, over any other photographic process. For a long time the employment of paper was confined to our own country, our continental neighbors devoting their inquiries to the processes and physical phenomena connected with the use of the metallic plates, constituting the tablets employed by Daguerre.

Reasons still more important than these may be assigned. Notwithstanding the statements which have been too often repeated, to the effect that the practice of photography is exceedingly easy, that the manipulatory details of preparation present no difficulties, and that little more is necessary than to place a paper in a camera-obscura, obtain a picture, and take it out again; it is a common complaint with amateurs that failure beset them at every stage of the process, and frequently they have abandoned the practice of photography in despair.

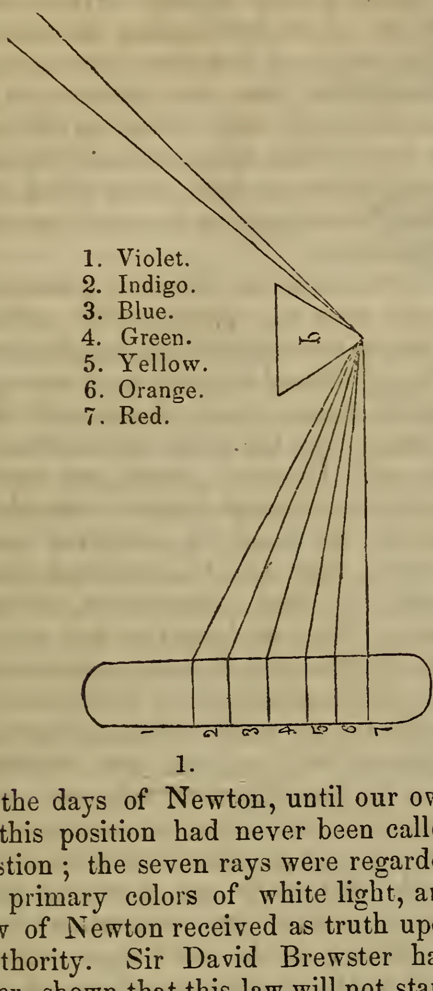
To pursue photography with success, it is essentially necessary that, by practice, the hand should be accustomed to the numerous manipulatory details; that, by repeated experiments, the causes leading to failure should be ascertained; and that a knowledge of the conditions under which the chemical changes take place should be obtained. This study without which there will be no real success, is most favorably pursued by experiments on paper; and such are therefore recommended to the amateur when first he enters upon this interesting pursuit; proceeding only to the delicate processes of the Daguerreotype when he has mastered the rudimental details of the more simple forms of *actino-chemistry.*

Previously, however, to explaining the practice of photography, it appears important that the physical conditions of the elements with which we have to work should be understood.

The sun-beam is our pencil, and certain delicate chemical preparations form our drawing-board. Every beam of light which flows from its solar source is a bundle of rays, having each a very distinct character as to color and its chemical functions. These rays are easily shown by allowing a pencil of sunlight to fall on one angle of a prism: it is bent out of its path, or *refracted*, and an elongated image is obtained, presenting the various colors of which Light appears to be constituted—red, orange, yellow, green, blue, indigo, and violet. This colored image is called the solar or the prismatic spectrum. The red ray, being the least refracted, is found at the lower edge, and the violet, being the most so, at the other extremity of this chromatic series. Below the ordinarily visible red, another ray of a deeper red, distinguished as the *extreme red*, or *crimson* ray, may be detected, by examining the whole through a deep blue glass; and, by throwing the spectrum upon a piece of yellow paper, another ray appears at the violet extremity, named by Sir John Herschel the lavender ray.

The original spectrum of seven bands of color was examined by Sir Isaac Newton,

and that eminent philosopher determined that a given degree of refrangibility indicated a given color; that the color of a ray at once indicated its angle of refraction.



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Since the days of Newton, until our own time, this position had never been called in question; the seven rays were regarded as the primary colors of white light, and the law of Newton received as truth upon his authority. Sir David Brewster has, however, shown that this law will not stand the test of examination. He has proved that the prismatic spectrum consists of three chromatic spectra overlapping each other, and those three colors, red, yellow, and blue can be detected, in every part of the images. Sir John Herschel has added two rays to the luminous or visible spectrum,—thus making the number nine instead of seven; but these can, equally with the others, be shown to be but combinations of the three primaries.

This will be rendered most familiar by calling to memory the conditions of that very beautiful natural phenomenon, the rainbow. The primary bow is usually accompanied by a secondary image, in which the order of the colors is reversed. From close examination of the prismatic spectrum I am disposed to believe that whenever we obtain this chromatic division of white light it is accompanied by a secondary spectrum, and that the real conditions of the colors are as follows:—

The *yellow* is the most luminous ray, and the illuminating power diminishes on either side of it; on one side it blends with the *blue*, to form the *green*, and on the other with the *red*, giving rise to the *orange* ray. The blue diminishing in intensity sinks towards blackness, and thus produces the *indigo*, the extreme edge of which represents the limit of the ordinary spectrum at that end; as the outer edge of the red forms its limits, as far the human eye is concerned, on the other. Beyond the indigo we have the *violet* ray: this would appear to be the blending of the red of the supplementary spectrum with the blue of the ordinary one, the *lavender* ray resulting from the intercombination of the less luminous rays with the colored surface upon which it is thrown. Then the *extreme red* or *crimson* ray will be seen to result from the blending of the extreme blue of the extraordinary with the red of the ordinary spectral image.

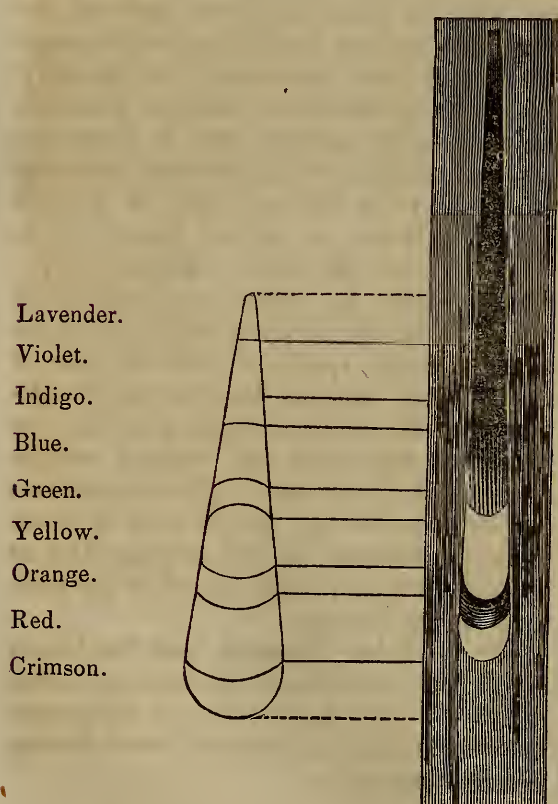
Sir William Herschel, and Sir Henry Englefield, determined the heating powers of these rays to be varied. A thermometer was placed in each, and the following results obtained:—

In the	blue	ray, in	3′	the thermom. rose from	55°	to	56°,	or	1°
"	green	"	3	" "	54	"	58	"	4
"	yellow	"	3	" "	56	"	62	"	6
"	full red	"	2½	" "	56	"	72	"	16
"	edge of red	"	2½	" "	58	"	73½	"	15½
Quite out of visible light in			2½′	" "	61	"	79	"	18.

Sir John Herschel, by another form of experiment, has fully confirmed these results, and shown that calorific, or *heat* producing radiations, being less refracted by the prism than the *light*-exciting rays, exist a considerable distance further from the visible rays than has been hitherto suspected. Light and heat have not, therefore, the same degrees of refrangibility; their influences are not coincident, their

maxima in the solar spectrum are wide asunder. Melloni has shown that, by the use of colored media, these agencies can be, to a considerable extent, separated from each other. Glass, stained with oxide of copper, and washed on one side with a colorless solution of alum, admits the light rays, most freely, but obstructs 95 per cent. of the heat rays. On the contrary a slice of obsidian or black mica obstructs nearly all the light radiations, but offers no impediment to the passage of heat.

The chemical influences of the prismatic rays are as varied as their heating powers. If we place a piece of photographic paper in such a position that the spectrum falls upon it, it will be found to be very unequally impressed by the various rays. Some



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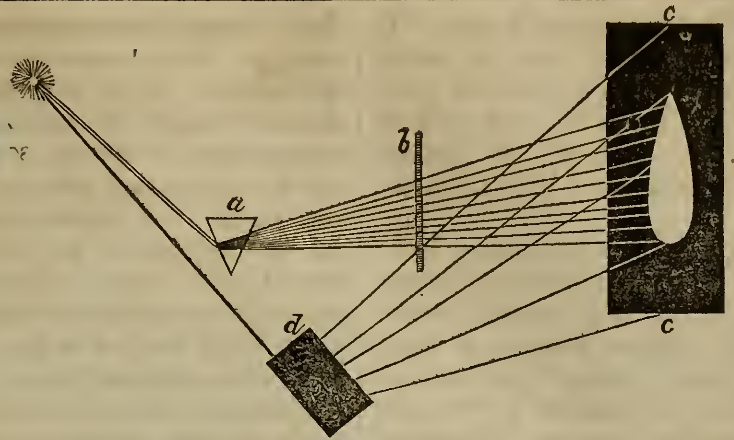
very extraordinary peculiarities have been observed by Sir John Herschel and myself; but it will be sufficient for our present purpose to state the general features of the impression. Some distance below the visible red ray, the paper will be found quite uncolored; on the part where the red ray falls, a tinting of *red* or *pink* will be evident. The orange and yellow rays leave no stain, and the green in general but a faint one. In the place occupied by the blue ray, the first decided darkening is evident, which increases through the indigo and violet rays, and extends some distance beyond them. The shaded wood-engraving (Fig 2) will serve to assist the reader in comprehending the phenomena. The chemical radiations have a higher refrangibility than the luminous rays, and consequently they extend in full action to a considerable space beyond the lavender rays, where no light exists which can produce excitement on the optic nerve of the human eye.

Whenever we throw a prismatic spectrum upon any photographic surface, it is always accompanied by a sufficient quantity of diffused light to produce some chemical change, which shows itself in darkening, over the parts beyond the colored image. However, there are two points where this change does not take place, and where the paper is preserved positively white; these are the points of maximum light and heat—the yellow and crimson rays. Here we have the first evidence of the interference of these agencies with the chemical radiations. I have recently devised a more satisfactory experiment, which appears fully to prove that, although united in the sunbeam, light and chemical power do not belong to the same agency. As we can separate heat and light from each other by the use of colored media, so can we isolate the chemical and luminous principles of the sun's rays. By a pure yellow glass we may cut off the agency producing chemical change so completely that the most sensitive photographic material may be exposed, covered by a glass stained yellow by oxide of silver, to a full flood of sunshine, without its undergoing any alteration in color. If, however, we take a dark blue glass, such as is usually prepared with the oxide of cobalt, of so deep a color that it obstructs a considerable quantity of light, and place under it the same, or any photographic preparation, it will be found to darken as rapidly as if no glass had been interposed between it and the sun.

Now, if we take a pale yellow glass, and place it so that the prismatic rays must permeate it to reach the sensitive surface on which we desire to obtain the chemical spectrum, it will be found, if the glass is not of too deep a yellow, that very slight change has been made in the arrangement and relative



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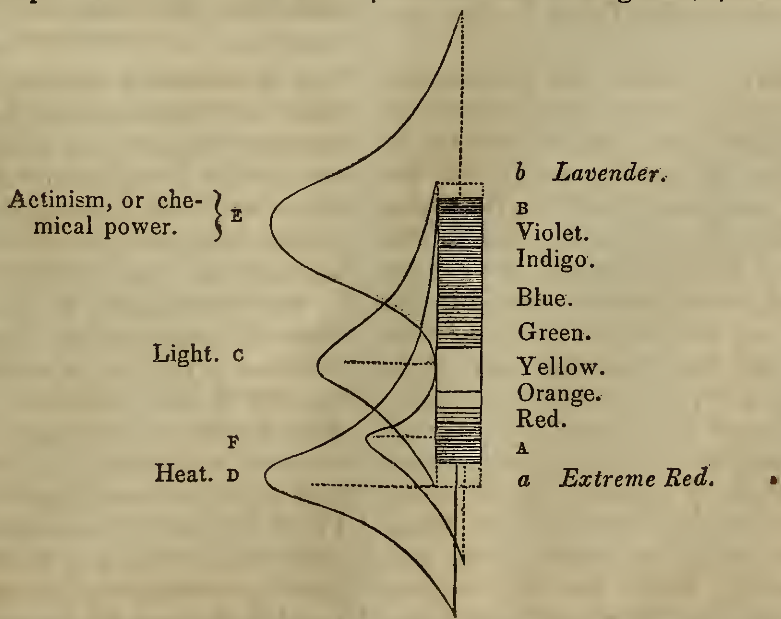
siz^s of the chromatic bands. Notwithstanding the amount of light impinging along this line, no change whatever takes place upon it. Preserving the prism *a*, the yellow glass *b*, and the paper *c*, in the same positions, place a mirror at *d*, so that the sunbeam is strongly reflected on the paper: it will be blackened over every portion except that upon which the spectral image falls: along this line the paper will still be preserved white and unchanged. Thus we obtain conclusive proof that it is not LIGHT, *luminous power*, which produces the chemical change: that it is not HEAT is shown in the same manner by the protecting influence exerted by the maximum calorific rays, and therefore we are driven to the hypothesis of the existence of a new agency—a new imponderable element,—or a novel form of force which is broadly distinguished from these principles or forces. To mark this the term ACTINISM has been proposed, and it is now very generally adopted. The word signifies nothing more than *ray-power* and therefore, as involving no theory, it is free from many of the objections which would apply to any other term involving preconceived ideas.

Photography is clearly a misnomer, since the pictures, so called, are not drawn by light. It is, however, too firmly rooted in the public mind to admit of the hope that any other may be adopted. If I might venture a suggestion I would advocate a return to the term introduced by Niepce, whose processes we shall have by and by to consider,—HELIOGRAPHY, *Sun-drawing*, which most clearly expresses the fact, leaving the question of the particular agent effecting the chemical change still open for examination.

The annexed figure (4) shows the con-



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ditions as they are at present known. It was published many years since by me in a paper communicated to a periodical journal; and since it has been confirmed by all my subsequent researches, it appears desirable to give it a more permanent record.

From A to B exhibits a Newtonian spectrum, *a* and *b* being the rays which belong to modern discovery. The curves C D and E, represent the relative maxima of heat, light, and actinism, F being a second apparent maximum,—indicated in the red ray,—of the chemical powers. This may, however, be proved eventually to be a function of heat, since we know that calorific power will produce chemical change even when it is exercised as a radiant force.

The operation of these antagonistic forces is somewhat remarkably shown over different regions of the earth. Advancing from our lands towards the tropics, it is found that the difficulties of obtaining pictures by the solar influences increase; and, under the action of the glowing light of equatorial climes, a much longer period is required for impressing a photograph than is occupied in the process either in London or Paris. It has been stated by Dr. Draper, that in his progress from New York to the Southern States he found the space protected from chemical change by the yellow rays regularly increasing.

The same result is apparent in the differences between the spring and summer. Usually in April and March photographs are more easily obtained than in June and July.

It is worthy of notice, that the morning sun, between the hours of eight and twelve, produces much better effects than can be obtained after the hour of noon: this was observed at a very early period by Daguerre. For drawings by application, this is but slightly, if at all, felt, but with the camera it is of some consequence to attend to this fact. We are not yet in a position to record more than the fact,—the cause of the difference is not yet determined; probably it may be found to exist in a greater absorptive action of the atmosphere, caused by the elevation of aqueous vapor from the earth. But the experiments of M. Malaguti seem to imply the contrary, this philosopher having found that the chemical rays permeate water more readily than they do air: some experiments of my own, however, are not in accordance with Malaguti's results. In the neighborhood of large towns it might be accounted for by the circumstance of the air becoming, during the day, more and more impregnated with coal smoke, &c., which offers very powerful interruption to the the free passage of the chemical rays. This will, however, scarcely account for the same interference being found to exist in the open country, some miles from any town. Until our meteorological observers adopt a system of registering the variations of light and actinic power by means of some well-devised instrument, we cannot expect to arrive at any very definite results. The subject involves some matters of the first importance in photometry and meteorology, and it is to be desired that our public observatories should be furnished with the required instruments for carrying out a series of observations on the diurnal and monthly changes in the relative conditions of the solar radiations.

Many of the phenomena of vegetable life will be found to be directly dependent upon the operation of these principles; and it would be important to mark any abnormal states of growth—such as not unfrequently occur—and to be enabled to refer them to peculiar solar conditions.

CHAPTER III.

SELECTION OF PAPER FOR PHOTOGRAPHIC PURPOSES.

It is natural to suppose, that a process, which involves the most delicate chemical changes, requires that more than ordinary care should be taken in selecting the substance upon which preparations of a photographic character are to be spread. This becomes the more evident as we proceed in our experiments to produce improved states of sensitiveness. As the material, whatever it may be, is rendered more susceptible of solar influence, the greater is the difficulty of producing perfectly uniform surfaces, and with paper this is more particularly experienced than with metal plates. Paper is, however, so convenient and so economical, that it is of the first importance to overcome the few difficulties which stand in the way of its use, as the tablet

on which the photographic picture is to be delineated.

The principal difficulty we have to contend with in using paper, is, the different rates of imbibition which we often meet with in the same sheet, arising from trifling inequalities in its texture. This is, to a certain extent, to be overcome by a very careful examination of each sheet by the light of a lamp or candle at night. By extending each sheet between the light and the eye, and slowly moving it up and down, and from left to right, the variations in its texture will be seen by the different quantities of light which permeate it; and it is always the safest course to reject every sheet in which such inequalities are detected. By day it is more difficult to do this than at night, owing to the interference of the reflected with the transmitted light. It will, however, often happen that paper which has been carefully selected by the above means will imbibe fluids very unequally. In all cases where the paper is to be soaked in saline solutions, we have another method of discovering those sources of annoyance. Having the solution in a broad shallow vessel, extend the paper, and gradually draw it over the surface of the fluid, taking care that it is wetted on one side only. A few trials will render this perfectly easy. As the fluid is absorbed, any irregularities are detected by the difference of appearance exhibited on the upper part, which will, over well-defined spaces, remain of a dull white, whilst other portions will be shining with a reflective film of moisture. Where the importance of the use to which the paper is to be applied,—as, for instance, copying an elaborate piece of architecture with the camera, or for receiving the portrait of an individual will repay a little extra attention,—it is recommended that the paper be tried by this test with pure water, and dried, before it is submitted to the salting operation. It will be sometimes found that the paper contains minute fibres of thread, arising from the mass of which it is formed not having been reduced to a perfect pulp. Such paper should be rejected, and so also should those kinds which are found to have many brown or black specks, as they materially interfere with some of the processes. Some specimens of paper have an artificial substance given to them by sulphate of lime (plaster of Paris), but, as these are generally the cheaper kinds of demy, they are to be avoided by purchasing the better sorts. No really sensitive paper can be prepared when this sulphate is present; and it has the singular property of reversing the action of the hydriodic salts on the darkened chloride of silver, producing a negative in the place of a positive photograph. It is the custom for paper-makers to fix their names and the date on one leaf of the sheet of writing paper. It is generally wise to reject this leaf, or to select paper which is not so marked, as, in many of the photographic processes which will be described, these marks are brought out in most annoying distinctness. From the various kinds of size which the manufactures use in their papers, it will be found that constantly varying effects will arise. A well-sized paper is by no means objectionable: on the contrary, organic combinations exalt the darkening property of the nitrate and muriate of silver. But unless we are careful always to use the same variety of paper for the same purpose, we shall be much perplexed by the constantly varying results which we shall obtain. No doubt, with the advancing importance of the art, the demand for paper for photographic purposes will increase: manufacturers will then find it worth the necessary care to prepare paper agreeable to the directions of scientific men; at present they are not disposed to do this, and our only remedy is a very careful selection. All who desire to make any progress in photography must take the necessary precautions, or be content to meet with repeated failures.

It has been noticed by Sir John Herschel, that "when thin post paper, merely washed with nitrate of silver, without any previous or subsequent application, is exposed to clear sunshine, partly covered by and strongly pressed into contact with glass, and partly projecting beyond it, so as to be freely exposed to air, the darkening produced in a given time is very unequal in the two portions. That protected by the glass, contrary to what might have been expected, is very much more affected than the part exposed; more, indeed, in some instances than in others.

The following tables will exhibit the results of an extensive series of experi-

ments, which were undertaken after the publication of Sir J. Herschel's memoir "On the Chemical Action of the Rays of the Solar Spectrum," in which he has given a table of results, obtained with different preparations on various kinds of paper; but as he has not established the influence of the paper, except in a few instances, independent of the preparation, it became desirable to endeavor to do so; and the result of several years' experience has proved the correctness of the conclusions then arrived at.

In pursuing this inquiry, it was found that the same description of paper, from different manufacturers, gave rise to widely different effects; so that the most carefully conducted experiments, several times repeated, have only given approximations to the truth. The form of experiment was to select a number of specimens of paper, —prepare them with great care in precisely the same manner, partly under glass, and expose them to the same solar influences.

I.—*Papers prepared with Muriate of Soda and Nitrate of Silver.*

a. Superfine satin post.	Considerable exalting effect.
b. Thick wove post.	Depressing influence.
c. Superfine demy.	Slight exalting effect
d. Bath drawing card.	Changes slowly.
e. Thick post.	Slight exalting effect.
f. Common bank post.	Ditto.
g. Thin post.	Very tardy.
h. Tissue paper.	Considerable exalting effect.

II.—*Papers prepared with Muriate of Barytes and Nitrate of Silver.*

a. Superfine satin post.	Slight exalting influence.
b. Thick wove post.	Do., but stronger.
c. Superfine demy.	Similar to *a*.
d. Bath drawing card.	Similar to *a*.
e. Thick post.	Considerable exalting influence.
f. Common bank post.	Similar to *a*.
g. Thin post.	Similar to *e*.
h. Tissue paper.	Results uncertain.

III.—*Papers prepared with Muriate of Ammonia and Nitrate of Silver.*

a. Superfine satin post.	Strong exalting influence.
b. Thick wove post.	Results uncertain — dependent on the size employed.
c. Superfine demy.	Slight exalting effect.
d. Bath drawing card.	Results uncertain.
e. Thick post.	Ditto.
f. Common bank post.	Very slow.
g. Thin post.	Ditto.
h. Tissue paper.	Strong exalting influence.

IV.—*Papers prepared with Iodide or Bromide of Potassium and Nitrate of Silver.*

a. Superfine satin post.	Darkens slowly.
b. Thick wove post.	Results uncertain.
c. Superfine demy.	Strong exalting influence.
d. Bath drawing card.	Very slowly changes.
e. Thick post.	Depressing influence.
f. Common bank post.	Slight exalting effect.
g. Thin post.	Ditto.
h. Tissue paper.	Results uncertain.

Unsized paper has been recommended by some, but in no instance have I found it to answer so well as paper which has been sized. The principal thing to be attended to in preparing sensitive sheets, is to prevent, as far as it is possible, the absorption of the solutions into the body of the paper,—the materials should be retained as much as possible upon the very surface. Therefore the superficial roughness of unsized sheets, and the depth of the imbibitions, are serious objections to their use. It must not, however, be forgotten, that these objections apply in their force only to the silver preparations; in some modifications of the processes, with the bichromate of potash, the common bibulous paper, used for filtering liquids, has been

found to answer remarkably well, on account of the facility with which it absorbs any size or varnish.

Great annoyance often arises from the rapid discoloration of the more sensitive kinds of photographic drawing paper, independent of the action of light, which appears to arise from the action of the nitrate of silver on the organic matters of the *size.* Unsized paper is less liable to this change. If we spread a pure chloride of silver over the paper, it may be kept for any length of time without any change of its whiteness taking place in the dark. Wash it over with a very weak solution of nitrate of silver, and, particularly if the paper is much sized, a very rapid change of color will take place, however carefully we may screen it from the light. From this it is evident that the organic matter of the size is the principal cause of the spontaneous darkening of photographic papers prepared with the salts of silver.

The most curious part of the whole matter is, that in many cases this change is carried on to such an extent that a revival of metallic silver takes place, to all appearance in opposition to the force of affinity. This is very difficult to deal with. Chemistry has not yet made us acquainted with any organic body which would separate either chlorine or nitric acid from their metallic combinations. I can only view it in this light:—the nitric acid liberates a quantity of carbonaceous matter, which, acting by a function peculiarly its own, will at certain temperatures effect the revival of gold and silver, as proved by Dr. Schafheutl's and Count Rumford's experiments.

Having been informed that the paper-makers are in the habit of bleaching their papers with sulphur and the sulphites, I have submitted a considerable quantity of the browned papers to careful examination. In all cases where the paper has *blackened*, I have detected the presence of sulphur. Consequently, when the darkening goes on rapidly, and terminates in blackness, we may, I think, correctly attribute it to the formation of a sulphuret of silver.

It is, however, certain that the slow action of organic matter is sufficient, under certain circumstances, to set up a chemical change which, once started, progresses slowly, but certainly, until the compound is reduced to its most simple form.

China clay—*kaolin*—has of late years been much used by the paper manufacturers, for the double purpose of giving weight to the paper, and of enabling them to produce a smooth surface upon all the finer varieties of paper; such as the "enamelled satin post." This compound of alumina and silica would not, if the finest varieties of clay were employed, be likely to do much mischief in the papers used for photography; but the less pure varieties of the Cornish clay are employed, and this commonly contains iron and other metals in a state of very fine division; and these where they come to the surface, form little centres of action, from which dark circles spread in rather a curious manner. In France there has been manufactured a paper for this special process; it is very thin, and of a tolerable uniform texture. It is said to answer exceedingly well with the modified forms of photographic manipulation employed in France, but it does not appear adapted, from some cause which is not clearly explained, to the English processes. Thin papers have been tried, and many varieties would answer exceedingly well, but that nearly every variety is found penetrated with small holes, which, though of minute dimensions, suffer light to pass freely, and consequently produce a spottiness on the resulting picture. Sir John Herschel found that this evil could be remedied by fastening two pieces of such paper together; but this method is troublesome and uncertain.

Returning to the consideration of *size* in the paper, the above-named authority—who employed the lead salts in some of his photographic processes—has the following remarks:—

"The paper with a basis of lead turns yellow by keeping in the dark, and the tint goes on gradually deepening to a dark brown. But what is very singular, this change is not equally rapid upon all kinds of paper,—a difference depending, no doubt on the size employed; which, it may be observed here once for all, is of the utmost influence in all photographic processes. In one sort of paper (known by the name of *blue wove post,*) it is instantaneous, taking place the moment the nitrate (if abundant) is applied. And yet I find this paper to resist discoloration, by keeping, better than any other, when the mordant base is silver

instead of lead. On the other hand, a paper of that kind called *smooth demy*, rendered sensitive by a combination of lead and silver, was found to acquire, by long keeping, a lead or slate color, which increases to such a degree as might be supposed to render it useless. Yet, in this state, when it is impressed with a photographic image, the process of fixing with hyposulphite of soda destroys this color completely, leaving the ground as white as when first prepared. This fortunate restoration, however, does not take place when the paper has been *browned* as above described. Some of the muriatic salts also are more apt to induce this discoloration than others, especially those with the earthy bases.

It will be evident from these remarks that it is of the utmost importance to secure a paper which shall be as chemically pure as possible. Experience has proved that recently-manufactured paper does not answer equally well with that which has been made for a year or two. It has been thought by many that this was an unfounded statement, but it is not so; and the causes operating to the improvement of paper by age are evident. The organic matter of the size is liable to a spontaneous change: this goes on for a considerable time, but at length the process becomes so exceedingly slow that it may, for all practical purposes, be said virtually to rest. Paper changes its color by keeping from this cause, and I have found that such as I have selected from the shop-worn stocks of stationers has been generally superior to that which has been more recently manufactured.

Select, therefore, paper of a uniform texture, free from spots, and of equal transparency, choosing the oldest rather than the newest varieties.

Where the process is highly sensitive for which the paper is desired, it is important to treat it in the following manner:—Having a shallow dish sufficiently large to receive the sheets of paper without in any way crumpling them, it is to be filled with very clear, filtered water, to which a sufficient quantity of nitric acid has been added to make it slightly sour to the taste Taking a sheet of paper, it should be laid on a porcelain slab, and sponged with clean water on both sides, after which it should be placed in the acidulated water, and allowed to remain in it for several hours. Too many sheets should not be placed in the vessel at the same time. After a time they should be removed in mass, placed on the slab, and left for half an hour under gently flowing water,—this removes all the acid, and all those metallic and earthy matters which it has removed from the paper. After this it is to be dried, and it is then fit for photographic use.

CHAPTER IV.

ON THE GENERAL MODES OF MANIPULATION ADOPTED IN THE PREPARATION OF SENSITIVE PAPERS AND THE MORDANT BASES.

The only apparatus required by the photographic artist for the preparation of his papers, are,—some very soft sponge brushes and large camel-hair pencils, (no metal should be employed in mounting the brushes, as it decomposes the silver salts), a wide shallow vessel capable of receiving the sheet without folds, and a few smooth planed boards, sufficiently large to stretch the paper upon, and a porcelain slab. He must supply himself with a few sheets of good *white* blotting paper, and several pieces of soft linen, or cotton cloth, a box of pins (the common tinned ones will answer, but if the expense is not a consideration, those made of silver wire will do better), and a glass rod or two.

The materials necessary to produce all the varieties of sensitive paper which will be brought under consideration in this section are—

1. Nitrate of Silver. The crystallized salt should, if possible, always be procured. The fused nitrate, which is sold in cylindrical sticks, is more liable to contamination, and the paper in which each stick of two drachms is wrapped being weighed with the silver, renders it less economical. A preparation is sometimes sold for nitrate of silver, at from sixpence to ninepence the ounce less than the ordinary price, which may induce the unwary to purchase it. This reduction of price is effected by fusing with the salt of silver a proportion of some cupreous salt, generally the nitrate. This fraud is readily detected by observing if the salt becomes moist on exposure to the air,—a very small admixture of copper rendering the nitrate of silver deliquescent.

The evils to the photographer are, want of sensibility upon exposure, and the perishability (even in the dark) of the finished drawing.

2. Muriate of Soda (Common Salt).
3. ——— of Baryta.
4. ——— of Strontia.
5. ——— of Ammonia.
6. ——— of Peroxide of Iron.
7. ——— of Lime.

   } These salts have very remarkable colorific properties.
8. Chlorate of Potash.
9. Chloride of Soda (Labarraque's disinfecting Soda Liquid).
10. Hydrochloric Acid (Spirits of Salts).
11. Solution of Chlorine in water.
12. Phosphate of Soda.
13. Hydrochloric Ether.
14. Tartrate of Potash and Soda (Rochelle Salts).
15. Iodide of Potassium (Hydriodate of Potash).
16. Bromide of Potassium (Hydrobromate of Potash).
17. Diacetate of Lead (Sugar of Lead).
18. Spirits of Wine.
19. Nitric Ether.
20. Distilled Water, or Boiled Rain Water.

All the above salts are necessary only for the purpose of giving a variety of color to the artist's productions. This is a point of much interest, as the result of using these different materials as the mordant base determining the tone of the finished picture enables us to produce effects which are in accordance with the subjects which we desire to represent.

To those who desire only to learn the rudiments of the art by the most simple means, nothing beyond the following solutions are required as the chemical agents.

1.	Nitrate of Silver,	40 grains.
	Distilled Water,	1 fluid ounce.
2	Common Salt,	20 grains.
	Water,	4 fluid ounces.
3.	Hyposulphite of Soda,	1 ounce.
	Water.	half a pint.

The easiest experiments will be made with a paper simply washed with solution No. 1, by which we prepare what is called—

a Nitrated Paper.

The most simple kind of photographic paper which is prepared is that washed with the nitrate of silver only; and for many purposes it answers remarkably well, particularly for copying lace or feathers; and it has this advantage over every other kind, that it is perfectly fixed by well soaking in warm water.

The best proportions in which this salt can be used are 60 grains of it dissolved in a fluid ounce of water. Care must be taken to apply it equally, with a quick but steady motion, over every part of the paper. It will be found the best practice to pin the sheet by its four corners, to one of the flat boards above mentioned, and then, holding it with the left hand a little inclined, to sweep the brush, from the upper outside corner, over the whole of the sheet, removing it as seldom as possible. The lines in figure 5 will represent the manner in which the brush should be moved over the paper, commencing at *a* and ending at *b*. On no account must the lines be brushed across, nor must we attempt to cover a spot which has not been wetted, by the application of fresh solution to the place, as it will, in darkening, become a well defined space of a different shade from the rest of the sheet. The only plan is, when a space has escaped our attention in the first washing, to go over the whole sheet with a more dilute solution. It is, indeed, always the safest course to give the sheet two washings.

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The nitrated paper not being very sensitive to luminous agency, it is desirable to

increase its power. This may be done to some extent by simple methods.

By soaking the paper in a solution of isinglass or parchment size, or by rubbing it over with the white of egg, and drying it prior to the application of the sensitive wash, it will be found to blacken much more readily, and assume different tones of color, which may be varied at the taste of the operator.

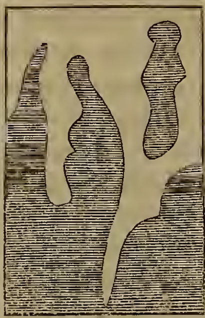
By dissolving the nitrate of silver in rectified spirits of wine, instead of water, we produce a tolerably sensitive nitrated paper, which darkens to a very beautiful chocolate brown; but this wash must not be used on any sheets prepared with isinglass, parchment, or albumen, as these substances are coagulated by alcohol.

The nitrate of silver is not sufficiently sensible to change readily in diffused light; consequently it is unfit for use in the camera-obscura, and it is only in strong sunshine that a copy of an engraving can be taken with it.

b. Muriated Paper is formed by producing a chloride of silver on the paper. This is done by washing the paper in the first place with the solution of muriate of soda, No. 2, and then, when the paper is dry, with the silver solution, No. 1, which it is sometimes necessary to apply twice.

In this process, which requires more care than may be at first conceived, we often suffer from the annoyances which arise from the unequal texture of the paper, and also from the want of uniformity in the distribution of the salts over the surface. It will not unfrequently be found that irregular patches, with sharply defined outlines, will appear on the paper, exhibiting a much lower degree of sensibility than the other parts of the sheet. These patches have been attributed by Sir John Herschel and Mr. Talbot to "the assumption of definite and different chemical states of the silver within and without their area." A few experiments will prove this to be the case.

Prepare a piece of the less sensitive paper, with only one wash of silver, and whilst wet expose it to the sunshine; in a few minutes it will exhibit the influence of light, by becoming very irregularly darkened, assuming such an appearance as that given in fig. 6, the light part being a



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pale blue, and the shaded portions a deep brown. In pursuing our inquiry into the cause of this singularity, it will be found that over the light parts a pure chloride of silver, or a chloride with a slight excess of the muriate of soda, is diffused; but over the dark parts the chloride of silver is united with an excess of the nitrate of silver. Where the rates of imbibition are different, this defect must follow, as a natural consequence, in very many cases; but it is found to occur frequently where we cannot detect any sufficient cause for the annoyance. Although we are acquainted with the proximate causes of the differences produced, yet the ultimate ones are involved in doubt. It is a remarkable fact, that the same irregular patches are formed *in the dark* on papers which have been kept a long time. Sir John Herschel suggested as a means of preventing these troublesome occurrences, that the saline wash used, should, prior to its application, be made to dissolve as much as possible of the chloride of silver, which it does to a considerable extent; and that the last wash of the nitrate of silver should be diluted with an equal quantity of water, and applied twice, instead of in one application. There can be no doubt but this evil is almost entirely overcome by operating in this way, but it is unfortunate that the process is somewhat injurious to the sensibility of the paper

Whatever may be the process employed, the same kind of manipulation is demanded; it is therefore exceedingly important that the first essays should be made in the most simple manner, and that to all difficulties attending the preparation of the paper. A few experiments of an easy character will be instructive, as pointing out the *modus operandi* to the student.

Experiment 1. Dry nitrate of silver, free of organic matter, will not blacken by sunshine; and, even when dissolved in perfectly pure distilled water, it may be exposed for a long time to solar influence without undergoing any visible change. Add, however, to the solution the smallest appreciable quantity of any organic matter,

and it will almost immediately begin to blacken. This is so certain, that nitrate of silver is the most sensitive test that we have for the presence of organic matter in solution.

Experiment 2.—Place a stick of charcoal in pure water containing nitrate of silver, and expose to sunshine. Under the radiant influence, most beautiful crystals of silver will form around the charcoal, until all the metal is separated from the solution. We here see that carbonaceous matter has the power, under the influence of the solar rays, to effect the decomposition of the silver salt. In the first example, we have the metal precipitated as a black powder—oxide of silver; in the last, it is revived as a pure white metal, the crystals being of exceeding brilliancy. Thus we learn that the organic matter of the paper or the size is necessary to determine the change on which the photographic phenomena depend.

Experiment 3.—Pour some of the solution of common salt into the solution of nitrate of silver; immediately, a very copious white precipitate takes place. Pour off the supernatant liquor, and well wash it, by the dim light of a candle, with pure distilled water; then expose it to daylight; it will change color very slowly, passing from white to grey. Drop a little nitrate of silver upon the white precipitate, it will darken much more rapidly than before; add a little organic matter, and the change occurs still quicker; and the degree of darkness which it eventually attains will be considerably deeper than before.

In this experiment we prove that, although the white salt of silver changes color alone, the addition of nitrate of silver and organic matter considerably quickens the operation: therefore, in preparing the papers, it is always necessary for the nitrate of silver to be in excess.

Experiment 4 —*To determine the character of the change set up by sunshine.*—Solution No. 1 is nitric acid and oxide of silver dissolved in water. Solution No. 2 is chlorine and sodium. These, when in solution, become hydrochloric (muriatic) acid, by the chlorine combining with the hydrogen of the water; and soda, by the sodium absorbing the oxygen from the same fluid. When these solutions are mixed, a white precipitate—*chloride of silver*—falls. The chlorine of the common salt seizes the silver, and as this is nearly insoluble, it is precipitated; the nitric acid combines at the same time with the soda, and this remains in solution. The chloride of silver being carefully washed, is placed in very pure distilled water, to which a minute portion of organic matter has been added, and then exposed to sunshine. After it has darkened, remove the water, and it will be found to contain chlorine; by adding some nitrate of silver, we shall obtain a fresh precipitate, and we may thus determine exactly the amount of decomposition which has taken place.

In the process, the strong affinity existing has been broken up. Metallic silver, in a state of very fine division, is produced; and the chlorine set free dissolves in the water, from which we can precipitate it by silver, and consequently readily ascertain its quantity.

Experiment 5.—Having allowed a mixture of chloride and nitrate of silver with a small portion of organic matter to blacken by exposure for some hours to sunshine, add some ammonia to the dark powder in a test tube. It will be found that ammonia will not dissolve it. This proves that it is not an oxide of silver, for if oxide of silver is put into ammonia it is immediately dissolved. Pour off the ammonia, and add some nitric acid, a little diluted with water, and the silver dissolves immediately with the formation of nitrous acid. This proves the fact of the conversion of the silver salts, in the process of darkening, into metallic silver in a state of very fine division

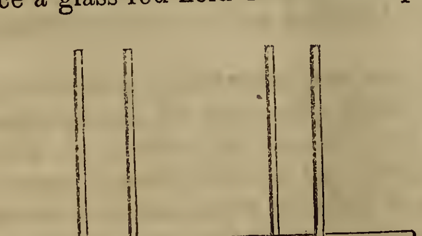
An attentive consideration of these results will serve to teach us the kind and character of the change which takes place. The silver salt is decomposed, and the gaseous element liberated either passes off or is absorbed by the paper, and the metal forms the dark parts of the resulting picture.

It is a very instructive practice to prepare small quantities of the solutions of salt and nitrate of silver of different strengths, and to cover slips of paper with them in different ways, and then to expose them altogether to the same radiations A curious variety in the degrees of sensibility, and in the intensity of color, will be detected, showing the importance of a very close

attention to proportions, and also to the mode of manipulating.

A knowledge of these preliminary but important points having been obtained, the preparation of the paper should be proceeded with; and the following method is recommended.

Taking some flat deal boards, perfectly clean, pin upon them, by their four corners, the paper to be prepared; observing the two sides of the paper, and selecting that side to receive the preparation which presents the hardest and most uniform surface. Then, dipping one of the sponge brushes into the solution of muriate of soda, a sufficient quantity is taken up by it to moisten the surface of the paper without any hard rubbing; and this is to be applied with great regularity. The papers being "salted," are allowed to dry. A great number of these may be prepared at a time and kept in a portfolio for use. To render these sensitive, the papers being pinned on the boards, or carefully laid upon folds of white blotting paper, are to be washed over with the nitrate of silver, applied by means of a camel-hair pencil, observing the instructions previously given as to the method of moving the brush upon the paper. After the first wash is applied, the paper is to be dried, and then subjected to a second application of the silver solution. Thus prepared, it will be sufficiently sensitive for all purposes of copying by application. The second wash is applied for the purpose ensuring an excess of the nitrate of silver in combination, or more properly speaking, *mixed* with the chloride. Mr. Cooper, with a view to the production of an uniform paper, recommends that it be *soaked* for a considerable length of time in the saline wash, and after it is dried, that the sheet should, by an assistant, be *dipped* into the solution; while the operator moves over its surface a glass rod held in two bent pieces



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of glass, as in fig. 7; the object of which is to remove the air-bubbles that form on the surface of the paper, and protect it from the action of the fluid. This process, however well it may answer in preparing paper for copying engravings, will yield paper not sufficiently sensitive for camera purposes; and it is objectionable on the score of economy, as a larger quantity of the silver solution is required to decompose the common salt than in the process described.

Papers prepared with the muriate of soda, have been more extensively used than any others for positive pictures, owing to the ease with which this material is always to be procured; and for most purposes it answers as well as any other, but it does not produce the most sensitive photographic ground.

Muriate of strontia, used in the proportion of thirty-five grains to two ounces of water with a silver solution of one hundred grains to the ounce, the metallic wash being applied twice, as before directed, forms a beautiful and very sensitive paper. Muriate of baryta, in similar proportions, produces a paper as much like it as possible, with this difference, that the barytic paper always assumes a peculiar richness of color. The colorific action of the barytic salts will become the subject of our remarks by and by.

It may not be entirely useless, or uninteresting, to state the more striking peculiarities of a few of the *mordant* washes, on the study of which depends the possibility of our ever producing photographs in their natural colors,—a problem of the highest interest. It will be found that nearly every variety of paper exposed to the full action of the solar beams will pass through various shades of brown, and become at last of a deep olive color: it must therefore be understood that the process of darkening is in all cases stopped short of this point.

In order to prevent unnecessary divisions in the subject, under this head will also be embraced a few other solutions, which are analogous to the muriates. It should be understood that, unless the contrary is distinctly stated, the proportion of silver to be used is as above recommended for use with the salts of strontia and baryta.

Muriate of Lime.—Not particularly sensitive, deepening to a brick-red in full sunshine, but is less liable to change in the

fixing processes than almost any other preparation.

Muriate of Potash is scarcely in any respect different from the muriate of soda. The nitrate of potash, however, which is formed in the paper, is less liable to be effected by a humid atmosphere than the nitrate of soda.

Muriate of Ammonia, used in the proportion of two scruples to four ounces of water and the silver solution in the proportion of sixty grains of the nitrate to one ounce of water, forms a very beautiful paper, equalling in sensibility the best kind prepared with the muriate of soda, at nearly one half its expense. It darkens to a fine chocolate brown.

Muriate of Iron.—A solution of this salt appears in the first instance to answer remarkably well; but, unfortunately, the pictures formed perish slowly, however carefully guarded from the influence of light.

Chlorate of Potash.—Mr. Cooper recommends a solution of this salt, and a silver wash of sixty grains to the ounce of water, as capable of forming a good paper.

Some of the specimens prepared with it are of exceeding beauty, the ground being of a very pretty blue, or rather lilac; but these papers cannot be used where any considerable degree of sensitiveness is desired.

Muriatic Acid.—A slightly acidulated solution of this acid produces a very tolerable paper, but it is extremely difficult to hit the best proportions for use. If too weak, the paper fails in sensibility, and a slight increase occasions a very injurious action on the paper, raising the pile like a down over the sheet. This kind of paper loses its sensitiveness with great rapidity: in about six or seven days, however carefully kept, it is scarcely susceptible to luminous influence. By washing the paper, after it is prepared, in pure water, it keeps much better; but, after being washed, light changes it to a rather disagreeable brick-red prior to which the color in general is a fine brown.

Dr. Schafhaeutl has proposed the use of the muriatic acid in a different way, to be noticed in a future chapter, and certainly his process has some advantages: when it is carefully attended to, the liability to spots or patches appears to be less than in any of the ordinary methods, and a very sensitive paper results, but it will not keep.

Aqueous Solution of Chlorine gives rise to a paper possessing in an eminent degree the merits of that prepared with muriatic acid, and it has the advantage of retaining its sensibility much longer.

Solutions of Chlorides of Zinc and Soda.—Either of these solutions may be used indiscriminately, provided the strength of the silver solution is such as to employ all the chlorine they have in their combination. They give rise to pictures having a deep red ground.

Hydrochloric ether.—When the nitrate of silver is dissolved in this ether, and applied without any preparation to the paper, it does not at first prove very sensitive to light; but after a little exposure the darkening process goes on with some rapidity, and at length passes into a deep brown, verging on a black. It is certainly preferable to the simple solution of the nitrate in water, but in no respect equal to the chlorides.

It is necessary now to direct attention to the effects of organic matter in accelerating the blackening process. Sir John Herschel, whose researches in this branch of science are marked with his usual care, has given particular attention to this matter. As it is impossible to convey the valuable information that Sir John has published, more concisely than in his own language, I shall take the liberty of extracting rather freely from his memoir, published in the Philosophical Transactions.

"A great many experiments were made by precipitating organic liquids, both vegetable and animal, with solutions of lead; as also, after adding alum, with alkaline solutions. Both alumina and oxide of lead are well known to have an affinity to many of these fugitive organic compounds which cannot be concentrated by evaporation without injury,—an affinity sufficient to carry them down in combination, when precipated, either as hydrates or as insoluble salts. Such precipitates, when collected, were adapted, in the state of cream, on paper, and when dry were washed with the nitrate. It was here that the first prominently successful result was obtained. The precipitate thrown down from a liquid of this description by lead, was found to give a far higher degree of sensitiveness

than any I had before obtained, receiving an equal depth of impression when exposed, in comparison with mere nitrated paper, in less than a fifth of the time ; and, moreover, acquiring a beautiful ruddy brown tint, almost amounting to crimson, with a peculiarly rich and velvety effect. Alumina, similarly precipitated from the same liquid, gave no such result. Struck by this difference, which manifestly referred itself to the precipitate, it now occurred to me to omit the organic matter (whose necessity I had never before thought of questioning), and to operate with an alkaline precipitant on a mere aqueous solution of nitrate of lead, so as to produce simply a hydrate of that metal. The result was instructive. A cream of this hydrate being applied and dried, acquired, when washed with nitrate of silver, a considerable increase of sensitiveness over what the nitrate alone would have given, though less than in the experiment where organized matter was present. The rich crimson hue also acquired in that case under the influence of light was not now produced. Two peculiarities of action were thus brought into view ; the one, that of the oxide of lead as a *mordant* (if we may use a term borrowed from the art of dyeing), the other, that of organic matter as a calorific agent.

"Paper washed with acetate of lead was impregnated with various insoluble salts of that metal, such as the sulphate, phosphate, muriate, hydriodate, borate, oxalate, and others, by washing with their appropriate neutral salts, and when dry, applying the nitrate of silver as usual. The results, however, were in no way striking, as regards sensitiveness, in any case but in that of the muriatic applications. In all cases where such applications were used, a paper was produced infinitely more sensitive than any I had at that time made. And I may here observe, that in this respect the muriate of strontia appeared to have decided advantage."

It would be tedious and useless to mention all the combinations of alkaline and earthy muriate which have been devised to vary the effect, or increase the sensitiveness, of the silver preparations ; the very considerable differences produced through the influence of these salts will afford peculiarly interesting results to any inquirer, and furnish him with a curious collection of photographic specimens. As a general rule, the solutions of the muriate, and indeed all other salts, and of the silver washes, should be made in the combining proportions of the material used. With a scale of chemical equivalents at hand, the photographic experimentalist need not err, taking care that a slight excess of pure nitrate of silver prevails.

The salt of iodine, bromine, and fluorine, have been extensively employed, but as these form the basis of particular processes, any account of the operation of them is reserved until these become the subject of consideration.

To be Continued.

ON ACIDS. I.—VEGETABLE ACIDS.*

Citric Acid is composed of four parts of carbon, four of oxygen and two of hydrogen ; it exists abundantly in the juice of lemons and limes. It has an acid taste and reaction, crystalizes in rhomboidal prisms, which contain two parts of water, and is soluble in less than its weight of water, and is decomposed by heat. By nitric acid it is converted into oxalic acid.

It is prepared by adding to lime or lemon juice, carbonate of lime until the acid is neutralized, washing the precipitate to free it from color and mucilage, and decomposing the citrate of lime by dilute sulphuric acid ; it is then filtered and evaporated to dryness.

The preparation of citric acid has become an important branch of chemical manufacture in consequence of its great consumption in several branches of the arts. It requires some skill and caution in its manufacture. The carbonate of lime must be perfectly dry and finely powdered, and the quantity consumed in neutralizing the juice must be exactly noted. The precipitate must be well washed, and the sulphuric acid used for decomposing it must be diluted in six or eight times its weight of water and thoroughly mixed with it. The agitation must be renewed occasionally for eight or ten hours, the dilute citric acid then poured off, the residuum of sulphate of lime thoroughly washed with warm water and the washings added to the dilute citric acid. The latter must then be poured off from the impurities which may have been deposited, and evaporated in a leaden boiler over a naked fire, until it acquires the gravity of 1.13, when the process must be continued over steam until a pellicle appears upon the surface. Unless great attention and caution is observed during this part of the process the whole will be carbonized and spoiled. You must, therefore, observe that the proper time for withdrawing the heat is indicated by a syrupy appearance assumed by the liquid and by the formation of a film or pellicle upon the surface, first in small patches, which gradually cover the whole surface. The evaporation must be stopped here, and the concentrated solution poured into clean and warm crystalizing vessels, which must be placed in a dry room where the thermometer does not fall below temperate. At the end of three or four days the crystals will be ready to remove from the pans. They must then be well drained off, re-dissolved in as little water as possible, again left to stand a few hours, then poured into the evaporating pots, evaporated and crystalized. If the operation is performed with care very pure crystals will now be obtained, but if any accident has prevented the necessary caution, a third, or even a fourth evaporation and crystalization will be required.

Citric acid crystalizes with great ease, but there are cases when the sulphuric acid is taken up by the free citric acid and materially obstructs the crystalization. This may be avoided by properly proportioning the ingredients, remembering always to put forty parts of dry acid to fifty of the carbonate of lime.

Citric acid of commerce is frequently adulterated with tartaric acid, but it may be easily detected by dissolving a little in water, and adding cautiously a solution of carbonate of potash, taking care that the acid be in excess ; when, if tartaric acid be present a white precipitate of cream of tartar will fall.

Carbazotic Acid—is composed of fifteen parts carbon, fourteen of nitrogen and fifteen of oxygen. It is procured by dissolving indigo in eight or ten times its weight of moderately dilute nitric acid and boiling the solution as long as fumes of nitrous acid are evolved. On cooling crystals are formed, and by evaporating the liquid and adding more water, more crystals again form. To purify this acid it must be dissolved in water neutralized with potassa and after repeated crystalizations the carbonate of potassa must be decomposed by sulphuric acid, and crystalized.

It forms brilliant yellow scales which are very soluble in boiling water, alcohol,

* Continued from vol. 3, No. 5, p. 275.

and ether; it has a bitter taste and is fusible and volatile. It forms salts with the bases mostly of a yellow color, and explosive when heated.

Boletic Acid is produced from the boletus pseudo ignarius, and was discovered by Braconnot. It is prepared by concentrating the expressed juice of the plant to a syrup by gentle heat, digesting in strong alcohol, and dissolving the residuum in water; then add a solution of nitrate of lead as long as any precipitate falls. This precipitate must then be washed with water, diffused through water in a tall glass, and while in this state a current of sulphuretted hydrogen passed through it until the lead is thrown down; then filter, evaporate and crystalize. Purify by re-dissolving in alcohol and again crystalizing.

Gallic Acid.—This acid is obtained from gall nuts, and is composed of four parts of carbon, three of oxygen and three of hydrogen. Its flavor is acid and astringent, it reddens litmus, and crystalizes in white plates; is soluble in three parts of boiling and twenty of cold water. It is very soluble in alcohol, and sublimes by heat.

It may be obtained by boiling one ounce of bruised gall nuts in one pound of water, until it is reduced to eight ounces; then strain. Take two ounces of alum dissolved in water, precipitate the alumina with carbonate of potassa, and after edulcoloration mix it with the decoction of gall nuts, frequently agitate it with a glass rod, and in twenty-four hours filter, wash the precipitate with water until its ceases to blacken sulphate of iron; mix the washings with the filtered liquor and evaporate. Gallic acid in fine needle shaped crystals will be the result.

Or you may expose a filtered solution of gall nuts in an open vessel, when it will grow mouldy and become covered with a thick glutinous pelicle, and flakes of the same nature will fall down, and in two or three months the sides of the vessel will be covered with small yellow crystals of gallic acid.

Another method is to add a strong solution of tannic acid to sulphuric acid as long as a precipitate falls, collect the powder, wash and dissolve it in diluted sulphuric acid over a gentle fire or hot sand bath; then boil for a few minutes, cool and collect the crystals.

In neither of these processes is the acid preserved perfectly pure; but it may be made so by combining it with oxide of lead and decomposing the compound by sulphuretted hydrogen.

With the bases gallic acid forms what is called gallate salts, such as the gallate of ammonia, gallate of lead, &c.

This acid is extensively used in photography, and was first applied successfully by Mr. Talbot the celebrated English wholesale patentee, who, like the dog in the manger, will not let the public knaw his bone neither will he knaw it himself, thereby depriving himself of the honor, more recently reaped by Mr. Claudet, Mr. Hunt, MM. Evrard, Le Gray, Baron Gross and others, of a more liberal turn of mind, and we can only excuse him on the ground that his propensity for patents is a mental disease, for if we are to believe common report he not only patents his own discoveries but those of others, and consequently he is continually getting himself into controversies.

The various methods of using gallic acid will be found in various portions of the Photographic Art-Journal, both past and future.

Ellagic Acid.—This acid was discovered by Braconnot, but its composition has never been ascertained. It is obtained from galls in the form of an insipid white or brownish white colored substance, possessing very slight acid taste. It neutralizes the pure alkalies, forming salts insoluble in water. With potassa it forms crystals similar to talc, and with nitric acid and heat, oxalic acid is produced. It is soluble in sulphuric acid, from which it is separated in water.

Kinic Acid was discovered by Hoffman in 1780, in different species of *cinchona*, by macerating bruised pale bark in cold distilled water for four days. Filter the solution and put it aside for a few days, so that the *kinate of lime* may separate by crystalization; filter to separate the kinate, dissolve it in distilled water and decompose by oxalic acid, then again filter and evaporate, when the acid will be obtained in crystals.

Another method is to dissolve the *kinate*

of lime in sulphuric acid, filter and evaporate to the consistence of syrup, when crystals will be gradually deposited.

Still another method, is to macerate bruised pale cinchona bark in distilled water, so as to obtain a strong infusion, then filter and evaporate to the consistence of syrup; treat with alcohol, and dissolve what remains in water; filter the aqueous solution and evaporate, when crystals will be formed, which may be purified by boiling with animal charcoal, again filtering and crystalizing. These crystals must be dissolved in ten parts their weight of water, decomposed by oxalic acid in small quantities, filtered and evaporated to dryness, and then re-dissolvod in water and crystalized by gentle evaporation.

Laccic Acid.—The precise composition of which is unknown, is obtained from stick-lac It is crystalizable, of a yellow color, has an acid flavor, and is soluble in ether, alcohol, and water.

Meconic Acid—Like the two last, the composition of this acid is unknown. It is found in opium. It forms beautiful pearly scales, possessing a sour astringent taste, and is soluble in water and alcohol, which solution is decomposed by boiling, and by animal charcoal. It fuses at 258° and sublimes unaltered, and reddens litmus paper.

It may be prepared from the meconate of ammonia, a salt formed during the preparation of morphia, by adding to the meconate diffused in water acetate of baryta. Double decomposition ensues, and an insoluble meconate of baryta falls down, which is to be decomposed by dilute sulphuric acid, when sulphate of baryta will be precipitated, and the meconic acid remains in solution, from which it is obtained by filtration and evaporation.

Mellitic Acid.—Composition unknown. It was discovered by Vilapute, and is obtained from honey stone or mellite. It is obtained by boiling the powdered stone in seventy times its weight of water, filtering, evaporating and crystalizing. It crystalizes in small bead prisms of a brown color and mild acid flavor, which are but sparingly soluble in water.

Myroxylic Acid—Is obtained from the efflorescence upon the morus mon. It crystalizes in colorless transparent prisms, which have a sharp taste, and reddens litmus. It sublimes by heat, and is soluble in alcohol It exists naturally in combination with lime, from which it is separated by dilute sulphuric acid, and afterwards filtering and evaporating.

Succenic Acid.—This acid is composed of four parts carbon, three parts oxygen and two parts hydrogen. It is procured from amber by heating powdered amber in a retort and collecting the acid which comes over; this is not pure, having a yellow color, owing to the presence of empyreurmatic oil, which must be separated by adding nitric acid, and re-distillation.

Succinic acid has an acid flavor, reddens litmus paper, and crystalizes in white transparent crystals, soluble in ninety-six parts cold and two parts boiling water. Boiling alcohol takes off half its weight. It is soluble in nitric and sulphuric acids, and muriatic acid converts it into a gelatinous substance.

Sorbic Acid—Is composed of three parts of carbon, four of oxygen, and ten of hydrogen. It exists in the sorbus aucuparia as a transparent, colorless inodcrous fluid, which when evaporated, forms a deliquescent uncrystalizable mass. By sublimation it crystalizes in white needles. It has been found to be malic acid.

NEW PROCESS.

For Obtaining Positive Proofs on Paper with a very varied Coloring and a much greater Fixedness than that obtained by the Old Methods.

Translated from "La Lumiere," for the Photographic Art-Journal, by W. Grigg.

THE progressive extension which Photography on paper is obtaining, has led me to occupy myself very particularly in endeavoring to give to positive impressions more agreeable tones, and especially in discovering a method of fixing them which should preserve them from the action of time. This important requisite to Photography having been, to this day, too little attended to. It has been for some time that amateurs in Photography have complained of seeing their most beautiful impressions gradually fade, and even sometimes to become completely obliterated. They complain of noticing this effect in impressions whose tones are of black and yellow sepia.

In this, I think, they are completely in error; these tones, by the ordinary processes, being, on the contrary, the most solid, when they are obtained of a good quality. The slight solidity of these kinds of impressions arises generally from the miscalculated employment of old hyposulphites of soda, too strongly charged with salts of silver.

As I was one of the first who recommended this kind of hyposulphite for obtaining dark and warm tones, and as I am consequently one of the first causes of this evil, I hold it my duty to point out plainly here the precautions that must be taken to remedy the difficulty and to give a perfect solidity to the impressions.

The positive impression may fade for two causes, either because it retains in the constitution of the paper salts of silver, or because it retains sulphur, or else hyposulphite of soda.

The first evil is produced: 1st. By being left for too long a time in the hyposulphite of soda, which leaves chloride of silver in the paper, which causes the impression to turn black. 2nd. By the employment of hyposulphite too strongly charged and sometimes even saturated with salts of silver, which it has obtained from preceeding impressions that have been submitted to its action, and from which it has taken all the chloride of silver not changed by the light. In this case the hyposulphite has lost its dissolvent property; the chloride of silver, instead of being carried off, is transformed into a double salt which remains in the paper, and which being, in part, insoluble in water, cannot be removed by even repeated washings; under these circumstances, the white parts of the impression become soiled in time, and the dark portions fade.

The second evil is produced: 1st. By the addition of an acid to the hyposulphite which then becomes decomposed and loses its sulphur.

2nd. By the immersion in the hyposulphite bath of too large a number of impressions at one time. The quantity of chloride and nitrate of silver, contained in these impressions, being, comparatively, in too great a proportion to that in the bath of hyposulphite, nitric acid is disengaged, the bath is decomposed, and an equal quantity of sulphur is precipitated upon each impression.

It will, therefore, be understood that in these two cases, the impressions will be spotted and stained, and that, moreover, they will gradually fade, the sulphur which they contain exercising a devouring action on the dark portions.

If the washing in water, on removal from the hyposulphite, has not been sufficiently repeated, the impression will still retain a quantity of this salt, which will still cause it to fade and become obliterated in time. I have now fully shown the causes which produce the destruction of these impressions, I shall now point out the means of avoiding them.

From what I have just stated, it results that the perfect fixation of the impression can only be obtained by the complete absence from the constitution of the paper of

all foreign matter, other than the salts of silver, blackened and reduced by light.

In order perfectly to free the impressions from all extraneous matter, fresh hyposulphite and liquid ammonia, which entirely dissolves the chloride of silver, are the chemicals which should preferably be employed. Sulphur of carbon and alcohol, which dissolves sulphur, should be employed to remove it from impressions which may contain any.

The hyposulphite of soda precipitating in black the nitrate of silver, in the state of sulphur, and entirely dissolving, on another hand, the chloride of silver, all the free nitrate of silver which it may contain, should be transformed into the chloride state before submitting an impression to its action. This result may be obtained by immersing the impression in a bath slightly acidulated with chlohydric acid, and by often repeated washings with water.

A positive impression should always be exposed for a sufficient length of time for it to support at least an hour the action of the hyposulphite, without losing any of the details, even of the lightest portions. *This mode of fixing* generally gives red and violet tones.

The impressions should then be left for about four hours in a plentiful bath of water, renewing the water every hour, in order to free it completely from the hyposulphite, which would equally soon destroy the image if it was suffered to remain in the paper.

If a still more perfect degree of solidity is desired, the impression, after having been dried with bibulous paper, on removal from the water, must be washed with spirits of wine, heated to 36 degrees, which will carry off any sulphur that may remain in it. The spirits of wine which has been used in this wash will serve for burning.

When old hyposulphite is employed, having already been used for cleaning other impressions, and containing salts of silver in solution, care must be taken to remove the impression before the d sired tone is arrived at; the tone can then be obtained by immersing it in a bath of fresh hyposulphite, after having previously passed it through the water for a minute or so. The operation of fixing is then finished as commonly, by washing repeatedly with water. Thus are removed the salts of silver which are left in the paper under the action of the first bath of old hyposulphite, which was not able to dissolve them entirely, and very strong and solid tones are obtained, which firmly resist the action of time.

This process gives a very varied series of tones, from the violet sepia to the yellow, touching on the blacks and colored sepias.

The pictures that I have obtained for a period of three years, in which I have observed these precautions, have remained unchanged, whilst those in which I neglected them have become effaced.

Contrary to the advice of many honorable authors, I totally proscribe the employment of any acids, as an addition to the hyposulphite of soda, for obtaining dark tones, if solidity is desired. The disengagement of sulphurous acids caused by this addition gives, indeed, fine dark tones to the impression, but as it at the same time precipitates sulphur, the impression will always retain a certain quantity of it, and will then, consequently, fade.

If, however, it was desired to employ this method, it would be necessary, after first washing with water, to wash the impression with alcohol mixed with the half or third part of the sulphur of carbon, and to remove the sulphur by a second washing in alcohol alone, and then to continue the water washes as before.

Not more than four or five impressions, moreover, should be put into the hyposulphite bath together, and care should be taken to frequently alter their position, as long as they remain in the bath, in order to avoid the deposits formed by one impression upon another. If in spite of this precaution it is observed that the impressions have a clumsy appearance, it will be necessary that they again undergo the same alcoholic washings.

In general whenever an impression presents a dull and clumsy appearance in the light portions, or that the white part of the paper does not remain pure and clear on the back, this impression will fade.

Impressions fixed with hyposulphite of soda warm, also change equally quick, the heat decomposing the hyposulphite.

Liquid ammonia completely fixes the positive impressions, and generally gives red tones, then warm yellow tones partaking of red. The image thus fixed is extremely

firm, if it has been well washed with water. It is necessary that the bath be fresh and somewhat concentrated.

By all these methods, which are those generally employed, except the modifications I have just pointed out, very beautiful impressions are obtained with warm and extremely vigorous tones; but the absolute black in the shades and the perfect white in the light parts are obtained with difficulty.

The white portions of the impressions, moreover, are almost always absorbed with a greater energy than the blacks, which effect is often observed upon an impression which appears to be realized. By a subsequent process I have arrived at a method of obtaining the black and white pure, blue black, print black, or chinese paper, and the greenish blue; and this too with the proper whites and a general appearance of freshness, impossible to be obtained by the preceeding processes.

But that which amateurs will more especially appreciate is, that by this process I do not lose a single detail in the positive impression, which is to be found in the negative; neither in the lights nor in the shades is anything solarized or lost, whatever may be its contrast with the negative.

As to the solidity and durability of the impression, I consider it to be perfect from the very nature of the precipitate formed upon the shades of the impression.

Gustave Le Gray.

THE NITRATE OR ACETATE OF SILVER.

Translated from "La Lumiere," for the Photographic Art-Journal, by W. Grigg.

ACETATE or nitrate of silver is the most important and the best known of all the salts of silver. It crystalizes in thin, square, colorless, transparent flakes, anhydrous and unchangeable by the air. It is soluble in its own weight of water, and still more soluble in boiling water; alcohol when warm dissolves a quarter of its weight, but only the 10.100 cold. It corrodes the skin. The black stains which it leaves on it disappear under the action of the iodide of potassium. This salt when pure produces no effect on blue *turnsol* paper, but it turns it red when it contains free nitric acid. The particles which compose the nitrate of silver separate very quickly, without becoming decomposed, and form on recondensation a crystaline substance, which is called the infernal stone.

In this state it is used as a caustic in surgery. The infernal stone is generally black on the outside and frequently throughout its whole mass; this is caused by a small portion of the nitrate being reduced by the metal of the mould into which the liquid stone is poured, or by the presence of organic substances.

This color is produced especially when the stone is prepared with commercial silver, which most frequently contains copper.

Under the influence of heat, the nitrate of copper contained in the nitrate of silver is decomposed, and from it results a bioxide of copper of a deep brown color.

At a red heat, the nitrate of silver is decomposed, and it is covered with a metallic coating. Mixed with sulphur and phosphorus it explodes on being struck with a hammer.

In pouring protochloride of tin into a plentiful solution of nitrate of silver, a purple precipitate is obtained by adding a few drops of diluted sulphuric acid. Mixed with lime water free from chloride, the nitrate of silver gives a brown precipitate,

which, taken up by the ammonia, produces, on drying, a sparkling powder. When cold, and even in the dark, phosphorus reduces the solution of nitrate of silver. Coal also reduces this salt, but only when warm or under the prolonged influence of light.

If a piece of linen be wet with a solution of nitrate of silver, and presented to a current of hydrogen, a black deposit of metallic silver will be formed upon it.

By writing with a weak solution of nitrate of silver upon well starched linen rendered alkaline by means of a small quantity of carbonate of soda, black and indelible characters are produced, which would make it extremely useful for marking linen.

The nitrate of silver combines with liquid ammonia and produces colorless crystals. The gas of ammonia combines directly with anhydrous nitrate of silver, which absorbs three equivalents of it.

This composition is soluble in water, and on being submitted to heat it is freed of the ammonia.

Nitrate of silver unites with the cyanides of mercury, copper and silver. This last composition explodes with violence on being exposed to heat.

Finely powdered silver may be dissolved in the nitrate of silver; the silver b comes oxidated at the expense of a portion of the oxygen of the nitric acid, and gives a clear yellow solution, which, evaporated and taken up with water, produces a neuter nitrate of silver, and a basic nitrate, insoluble and of a yellow color.

The nitrate of silver is obtained by dissolving pure or mint silver in nitric acid. "To prepare this salt with silver alloy, a coin composed of silver and copper is dissolved in nitric acid, the solution is evaporated to dryness in a porcelain retort; the residue is then kept for some time at a h at somewhat below a dull red. The nitrate of copper is decomposed and an insoluble oxide of copper is left behind.

It is observed that all the nitrate of copper becomes decomposed, and that the calcination may be arrested when the liquid mass which is, in the first instance blue, becomes colorless,—and, moreover, that it has ceased to disengage putilant vapors.

"It is necessary to be perfectly sure, also, that a small quantity of the matter taken from the mass with a glass rod, does not turn blue on the addition of ammonia.

"The nitrate of silver being thus separated from the nitrate of copper, the mass may be taken up by water, which leaves an oxide of copper and dissolves pure silver." (Pelouze).

To prepare pure nitrate of silver, a certain quantity of oxide of silver, which completely precipitates the oxide of copper, is to be added to the solution of the coin in nitric acid—which solution contains nitrate of silver and nitrate of copper.

The honor of this process is due to M. Gay Lussac.

There being no particular necessity that the oxide of silver which is used in this purification should be pure, a portion of the nitric solution of copper and silver may even be used in the preparation of it, which is to be mixed with an excess of potassium.

In order to separate the copper from the silver, the solution of the alloy may be precipitated by a small quantity of potassium. It first acts on the salts of copper. The addition of the potassium must be discontinued when the precipitate, at first blue, becomes of a brown color. The liquid when filtered contains nothing more than nitrate of silver and nitre.

The last mentioned salt does not alter the ordinary effects of nitrate of silver. We will now say a few words concerning the influence which light excercises on the nitrate of silver.

According to M. Hoefer, it turns black in light; but the opinion of M. Pelouze and other chemists is, that light would only decompose it when containing organic matters. The following are the op nions of Mr. Robert Hunt on the subject:

"Nitric acid seems in this case to be the agent which destroys the organic matter, and the black stain which it produces is owing to the separation of oxide of silver, (Turner). I think I may safely add that the organic body afterwards combines with the silver.

"Count Rumford has made known the property which coal possesses of reducing the solutions of the salts of gold and silver with a temperature below that of boiling water, *and in the dark*, and he has remarked that the same effect takes place by exposing these salts to the solar rays,

whence he concludes that "the chemical properties attributed to light" were owing solely to the heat of the solar rays. Experiments with the prism have proved that deduction false; the rays, in fact, which possess the greatest calorific power, very feebly aid the reduction spoken of. The nitrate of silver precipitates very rapidly beneath the influence of rays which have been deprived of their caloric by causing them to pass through sheets of alum; and this too when the solution was kept at a temperature of 32° Farenheit (from zero to a hundred.)

"The solar rays first turn the paper, coated with nitrate of silver, to a light brown, which tint gradually dies off; then that part of the paper on which the blue rays fall changes to a bluish brown, and beneath the violet rays a very pronouncable green tint is manifested at the point which corresponds with the least refrangible blue rays." This last experiment is due to Sir John Herschel.

When the paper coated with nitrate of silver is exposed, whether to the direct action of the solar rays, or whether to the diffused light of the sun when shrouded with clouds, the paper is seen to change first to a lilac blue, from that it passes to a violet blue, to a dark violet, and then to a brown; lastly it assumes a green color, and has the appearance of the returning of the silver to the metallic state. This influence of light on nitrated paper is the basis of the operation by which positive impressions are obtained, an operation familiar to all photographers. ERNEST LACAN.

THE PHOZOMETER APPLIED TO PHOTOGRAPHY.

Translated from "La Lumiere," for the Photographic Art-Journal, by W. Grigg.

THE Journal *La Lumiere* has been agitating a question concerning the *individualisation* of photographic object-glasses;—two methods of accomplishing it have been proposed. 1st. By giving to each object-glass its own proper name; 2nd. By indicating some of its characteristic dimensions, (the diameter, for instance, and the focal length.) Against the first of these methods it has been urged that it would be easy to apply to an indifferent object-glass the name given to the best of these instruments. The second method which seems to us the most reasonable is left without application to the cause of the practical difficulties, on account of the *indefinibility* (may I use the term) of what should be called *focal length* in a compound system, the problem has then been left without solution.

A simple object-glass infinitely placed at a certain distance before a luminous point, gives place to the formation of an image behind it, at a distance which we will represent by the letter L, so that we have:

$$\frac{1}{a} + \frac{1}{L} = \frac{1}{p}$$

p being the distance at which the converging rays unite.

By means of the phozometer the distance p can be obtained, at least to within a thousandth part. The optician's art would never be able without endless uncertainty, or by a truly wonderful chance, to produce two object-glasses both equal in this respect, only differing about a thousandth part.

The problem, then, of the individualisation of the glasses may be considered as resolved by means of this new instrument, especially if the distance p is determined not only for the visual focus but also for the photogenic focus, under the circumstances given, among which the temperature must not be forgotten.

In that which concerns the photogenic

focus the opinions of learned men and photographers are still very much divided: there evidently yet remains much to be done. The photogenic intensity of the different diversions of the solar rays is not yet understood; it cannot be said, for example, whether in a certain point of the solar spectrum it is totally null, or whether it is only very slight: neither can it be asserted in an incontestible manner, that there is an intensity in the negative from any points of the spectrum.

Object-glasses are often known to give very fine photogenic impressions, though their visual achromatism was very imperfect, but what experience appears to have demonstrated is this:

1st. That photogenic achromatism should only differ from astromonical achromatism in *temper*.*

2nd. That the temperature makes the amount of refraction of the different portions of the spectrum vary in a different manner, especially towards the most refrangible extremity, where the greatest photogenic power seems to reside; whence it follows that an object-glass may present, at a given temperature, the perfect coincidence between the two kinds of focus, and that it cannot show it at any other temperature. Experiments with the phozometer, well followed up, and skillfully varied, will alone be able to throw light on this still very abstruse question of photographic optics.

J. Porvo.

GALVANIZING PLATES.

Utica, May 24, 1852.

R. H. H. Snelling—Dear Sir: By your request I forward for publication in your valuable Journal, my process for galvanizing daguerreotype plates, which, though simple in the extreme, has proved infallible with me for the last two years, during which time I have used it, after having tried, or experimented, to a considerable extent with the various kinds of batteries that are recommended for galvanizing daguerreotype plates. I came to the conclusion that they were all wrong, from the fact that they generated electricity only for a short time after being charged, and then again failed to produce a sufficient quantity, thus rendering it extremely difficult to manage them—then in the one condition perhaps one minute is sufficient for the plate in the battery, then again it will require three minutes.

It is not my intention to write a treatise on electro-plating, neither time nor tact will allow me to do so; I will merely suggest a plan for a battery, how it should be used, the manner in which the silvering solution should be prepared, &c.

Perhaps no process of daguerreotype manipulation is as little understood by those who practice the art as that of galvanizing the plates, yet no one process is more important. And galvanizing, although a laborious task, in the end facilitates the production of pictures, and adds much to their richness and beauty, and is indispensable to their durability.

For galvanizing daguerreotype plates I would reccommend the following battery—A copper cup and zinc; a glass in the bottom of the cup for the zinc to set on, which breaks the electric current from the cup to the zinc, thus giving a negative and positive current. The cup should be filled

* The perfect scale of musical sounds does not admit the possibility of instruments with made notes; yet the geometrical progression differs so little from the true sound, that the differences are scarcely perceptible to the most delicate ears. The equation of these differences is what is called in music the *temper*. We call, in optics, by analogy from the same name, the law which is substituted for the true law of dispersion for achromatising object-glasses, the *mean* law.

with soft water to the top of the zinc, (Morse's telegragh zinc answers well,) and add about a half tea-spoonful of sulphuric acid. The zinc should be amalgamated with mercury every night, and set in a glass or earthern plate to drain, and should be washed in clear water a number of times during the day, while using it. Add a few drops of sulphuric acid to the battery solution once in eight or ten days, as necessity requires, and brighten the poles of the battery every morning before using it, and continue to brighten them as often as they become corroded.

There are a variety of ways for holding the plate, or suspending it in the solution; that which pleases me best is simply a copper hook or claw, with a shoulder or zag near the top for the plate to rest against. In preparing the silvering solution, I would recommend the following simple yet certain method. If you wish to make two gallons or the usual full size, saturate one pint of pure water with cyanide of potassium, until there is an excess of potassium in the bottom of the bottle or vessel used, then add to the solution of cyanide as much oxide of silver as it will take up, which will not be less than two ounces, thus giving a saturated solution of both cyanide of potassium and oxide of silver, and on every occasion when this solution is made, whether much or little, it should be made in the same manner. This solution may be kept ready for use in a bottle with a ground glass stopper for any length of time. Fill the solution jar nearly full of pure soft water, and add of the dissolved silver until the plate is sufficiently coated in one minute, or as much as desired.

This solution requires no filtering; it should be well stirred with a glass or wooden rod every morning before using it. The plate for galvanizing should be well cleaned and buffed, and it should be immersed in pure soft water before it is placed in the battery or silvering solution

A plate of pure silver should be suspended in the silvering solution from the positive pole, weighing from five to twenty ounces, and nearly the size of a full plate. This silver plate requires no attention further than to keep it well connected with the pole on which it hangs. The process of galvanizing, when understood, is extremely simple, and requires but little attention, yet that little attention must be given to it in order to meet with success.

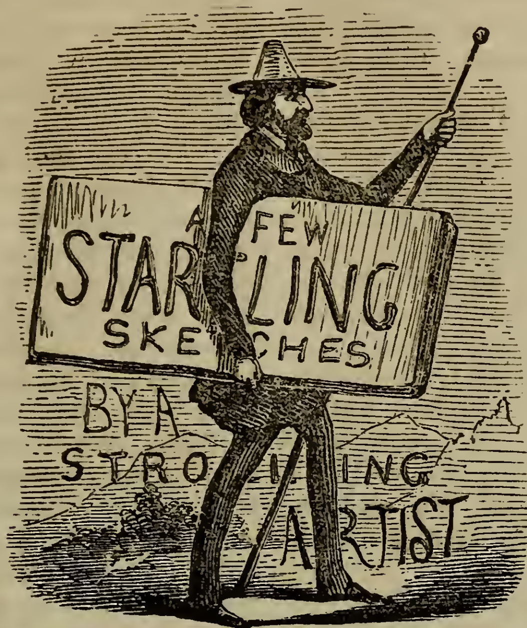
Friend Snelling, in this receipt hastily prepared I do not expect to benefit those whose experience and advantages have been greater than my own, I only hope to help those of less experience, I submit the humble effort to your judgment, publish or burn it as you think best.

Respectfully yours,
D. D. T. Davie.

Remarks by the Editor —We have conversed with several operators on the subject of galvanizing daguerreotype plates, many of whom have followed Mr. Davie's method; these pronounced it decidedly the best of any they have tried and they profess to have used all the processes in vogue. There is no better evidence, however, of its superiority than Mr. Davie's own pictures, which, for uniformity of excellence are not surpassed. In this opinion all who have seen his collection will no doubt concur.

THE MAGNETIC DAGUERREOTYPES.

FROM



IT was in Berlin I first saw the Professor Ariovistus Dunkelheim. I found him seated in his studio, smoking a pipe, with a spiral glass tube six feet long, whose glittering convolutions absolutely dazzled the eyesight. His head was bald, saving a kind of scalp lock that came down to a point over the centre of his forehead, and two tufts at the side, so stiff and wiry that they resembled horns, and gave the Professor an aspect which reminded me of the popular portraits of Satan.

His large, long, bottle-green eyes, with coal-black lashes, and brows that nearly met, had a most unpleasant expression of critical penetration. His nose was thin and beak-like, his mouth a line, which a great artist might have drawn by one masterly stroke of the pencil. His visage was long, and in stature he was very tall. This became apparent, as he rose, on my entering the apartment.

"I have heard," said I, "Herr Professor, that you effected some very curious improvements in the daguerreotype?"

"Improvements!" replied the Professor, with suppressed disdain; "I believe Newton *improved* on the system of Ptolemy. Improvements indeed! So they call a new science—the most wonderful science ever invented—an *improvement?* No, sir, my *invention* has no more to do with Daguerre's crude experiments, than the man in the moon with the London Bible Society! Look here! you see this polished plate of steel—is it not a perfect mirror?"

"Perfect—the reflection is exact!"

"I can *fix* that reflection."

"As I see it?"

"As you see it. But I can do more—do that to which the mere fixing of the reflection is a trifle. However, my hours are precious. I was just meditating on an electric telegraph without wires, as you entered, and had all but mastered the details. Excuse my asking you at once, what is your object in calling upon me?"

"To learn whether you are prepared to take for me by your newly-invented process, two portraits, the one of myself—"

"And the other?"

"Of a lady."

"An old lady—a grandmother?"

"A beautiful girl of nineteen—the loveliest woman in Berlin.'"

"Your mistress?"

"My betrothed."

"Good," said the Professor. "Come to-morrow, at this hour, and your wish shall be gratified."

"And the terms—I merely ask, in order that I may bring the requisite sum with me?"

"I am a man of science, not a trader,' replied the Professor. "However you, can allow me to keep copies of the portraits as I am desirous of increasing my collection of specimens, and as you say the young lady is pretty, her likeness will be an interesting acquisition."

At these words, the Professor seemed very much amused by some reflection that passed through his mind for his ordinarily inscrutable countenance relaxed into a faint ironical smile, whilst something of a sensual softness came over his dark eyes, as he bowed gravely at the door, through which I vanished

On the following morning I was punctual to my appointment. Elora Von Rabenstock was on my arm. A modest blush overspread her fair delicate features (a refinement on Danecker's Ariadne,) as Dunkleheim greeted her with a look of unequivocal admiration. His piercing gaze and singular expression disconcerted Elora, and I felt angry with the Professor for being a person of so uncomfortable an aspect. No fault, however, was to be found with his manners. His courtesy left nothing to be desired. Perceiving my intended bride's embarrassment, he strove to relieve it, by drawing her attention to some galvanized reptiles, which he caused to writhe and twist in a very remarkable manner.' This would have alarmed many girls of Elora's age But Elora was an angel of light as well as of beauty. We had laid the foundation of our love deeper than the passions —in intellectual sympathy. Together we had plucked of the tree of knowledge, as well as of the tree of life, and learned to make the bitters of the one add a relish to the often cloying sweetness of the other. Never was Elora weary of the study of nature, or of the mysteries of science.

Bidding us take our seats before what appeared to be merely two plates of highly polished steel, the Professor next desired us to remain perfectly motionless, with our eyes fixed upon their mirrored counterparts. Scarcely had he uttered this direction; when he relieved us from the task by the surprising assurance that the portraits were already effected. Our astonishment may be imagined, when detaching the two steel mirrors from the complicated apparatus that supported them, and which only became fully visible on their removal, he assured us that the operation was completed.

Without giving us time to gratify our natural curiosity, he placed the plates in a flat morocco case, and informed us that it was absolutely essential that they should remain in total darkness for the ensuing twelve hours

"For the action," said the Professor, "is of so subtle an electro-galvanic, or more correctly speaking, magnetic (that is, to use Reichenbach's phraseology, *odylic*) character; that the influence of the day light would in a few minutes destroy the impressions. Artificial light, however, unless produced by electricity, will not effect them perceptibly for a long period. It is, therefore, only at night-time and by lamp-light, that it is advisable to regard the portraits. Now, resume your seats for a few seconds longer, in order that I may take duplicates for myself,—thank you, that will do. Here is your case. It is now noon, do not open it till midnight. Good morning Fraulein; good morning, my young poet. I know you better than you know me, and shall know you still better—adieu."

And so we departed from the presence of a man in whom I then little dreamed of recognizing the object of an implacable and eternal hatred.

Yet even in the valedictory smile of the Professor was a menacing significance, which I afterwards recalled with horror. It was the grin of the devil when he defrauds man of his soul, the exultation of the priest when he cheats woman of her reason.

"Thank God! we are out of the presence of that man!" exclaimed Elora.

I made no answer, for I felt that a sympathetic shudder pervaded both our frames. The same evening, Elora was slightly indisposed, and retired early to rest. Thus it happened that—in the solitude of my own apartment—I first contemplated the results of the Professor's mysterious science. I opened the case, and took out one of the steel plates. I regarded it closely. It reflected my own features like a common mirror. The Professor was a farceur, his discovery a hoax! his mysterious smile the vulgar triumph of a mere practical joker!

"Pshaw! it is but a paltry jest!" I muttered, indignantly, as I dashed what I

now took to be a worthless plate of metal to the ground. The disappointment was intense, and I paced rapidly up and down, to calm the feelings of irritation that possessed me. In so doing, my eye repeatedly fell upon the plate of polished metal as it lay upon the floor. Its glitter became an eye-sore and a nuisance. I resolved to replace it in a box, in order that its contemplation might no longer annoy my nerves, in so doing, my glance rested accidentally upon the second plate, the aspect of which at once filled me with astonishment and wonder. It was no deception—I indeed beheld Elora—Elora in all the glow of her matchless complexion and shining hair—Elora, as the most faithful mirror alone could represent her—Elora living, breathing, moving—yes, moving, for even as I gazed the soft blue eyes which met mine, evidently unconscious of my presence, closed gently, and were hidden by their snowy lids, whilst the rose-tinted lips parted slightly in a smile of angelic innocence, and a sleeping beauty's reflection replaced the waking image of my mistress.

The clock struck twelve—but it might have struck fifty, and I should scarcely have given the phenomenon a casual thought. It struck one—two—three—four—and still I remained riveted in contemplation of the changing reflex of my beautiful Elora, whose features had become an index of her dreams, and with every minute that passed expressed some new shade of feeling, some fresh gradation of internal emotion and changeful fancy.

It was, indeed, a glorious gift the Professor had given us! He well might claim for his invention the name of a new and unparalleled science! There could be no doubt but that an inexplicable sympathy rendered the metallic reflector a faithful mirror of the absent Elora's features, with all their variations of expression and loveliness. Delicious thought! From the present moment to the hour of our nuptials, our parting would be nominal and not real. Spiritually united, we could hardly be said to be materially separated; since the magic mirrors would, by the medium of the most noble of the senses, render us forever present to one another. How superior to the cold, ghastly, shadowy immobility of the mere daguerreotype, were these living portraits of Dunkelheim's.

CHAPTER II.

Elora and I had no secrets from one another! but a hideous reminiscence, at this moment, rose like a phantom of evil to damp my enthusiasm for the portraits. *The Professor possessed copies.* Hateful and revolting idea! It was no longer Elora but Dunkelheim, the critical and penetrating Dunkelheim, who would be enabled to watch every change in the expression of my face, to read my every thought, as in an open book, to amuse his leisure with the mockery of my inmost emotions, and—more horrible yet—Elora's! A loathsome and accursed fantasy! to live forever in the presence of such a man as Dunkelheim, to be for ever subject to an excruciating moral espionage! to be denied for life, the security and luxury of privacy! to be haunted, in solitude, by an unseen tormentor!

I absolutely gnashed my teeth with rage, and, turning towards the pier glass, by accident, was appalled at the deadly ferocity expressed by my ordinarily calm and serene countenance. The reflection that, probably, at that moment, the diabolical Professor was quietly watching my ghostly prototype, caused me, however, instantly to control the muscles of my features, and assume an indifferent expression. It would not do to let the Professor perceive my agitation, as it was my purpose to visit him on the following morning, and, either by fair means or force, obtain from him the restoration of the portraits he had retained.

I passed the rest of the night in gazing on the spectrum of Elora, in which occupation, however, I discovered a new and unexpected source of torture. The perpetual contemplation of her exquisite charms in their careless and unconscious abandonment, awoke in me such a fever of impatient love that a hundred times I was upon the point of dashing the tempting mirror to the ground, as I had dashed its companion portrait. But an irresistable fascination withheld me, and I continued to gaze and gaze with an intense and burning ardor that threatened to disorder my intelligence.

At length the hour for morning visits arrived. Before hastening to the Professor, an involuntary impulse guided my steps to the abode of Elora. I found her

recovered from her indisposition, and attired in a morning dress of light blue muslin, that gave increased brilliance to her dazzling fairness of complexion. She sprang to meet me with her usual girlish disregard of ceremony, but paused, suddenly, in alarm at the unusual paleness of my features, and the passionate intensity of my gaze.

"What is it, you are not well?" she exclaimed, timidly.

"Oh, Elora!" I exclaimed, suddenly, seizing her hand, and drawing her toward me—"the portraits!"—and I told her all.

She returned my gaze of horror and perplexity, then, after a time, she said, gravely.

"My dear Ernest, I will never, never marry, whist that man possesses our portraits—whilst—"

"I undesrand you, Elora," said I, drawing her closer to my heart; "whilst a detested stranger can, at will, become a witness of our most rapturous moments, our most secret delights, our—"

"You forget!" shrieked Elora, "that even now—" and we recoiled from one another in deep blushes and confusion, whilst Elora, fixing upon me a look of painful reproach, said gently: "Oh, Ernest, why—why did you subject me to this fearful experience?"

"Alas! how could I imagine all the consequences of an invention so unheard of, so portentious? But my resolution is taken—I go this instant to the Professor's. He either restores our portraits and our peace of mind, or—"

"Beware of violence! for my sake, Ernest, restrain your savage impetuosity."

"Or *he dies!*" I concluded, with a smil, intended to deceive the Professor, but which did not deceive Elora, who would have detained me, had I not rushed, like a madman, from the house.

On reaching the dwelling of the Professor, I learn d that Ariovistus Dunk lheim had quitted Berlin that morning in a private traveling chariot, with all his baggage, and left no directions as to letters or visitors.

I returned to Elora in a condition of monomania.

"Professor or devil! I will find him upon earth, if earth harbors him, or descend into hell in the pursuit!"

"Nonsense," said Elora. "After all, what difference does it make in reality. Let us forget that such a man as the Professor exists. But I have not seen the portraits."

I brought her mine, and left the room, that she might judge of the effect.

I found her in deep reflection.

"And you can watch me at all times, when I am alone?" said Elora.

"Certainly, dearest; I was gazing upon you all last night—you must have had delightful dreams!"

Elora became crimson.

"Give me that portrait?" she said with downcast eyes, but impatient tone.

"Never—till I possess the original!"

"I insist upon it!"

"Dearest Elora, I cannot!"

"You *must!*" said Elora, imperiously, with one of those looks that conquer conquerors.

"No, the sacrifice is too great."

'It is less, I trust, than the sacrifice of your bride?" said Elora, in a lower, but less imperious tone.

"My dearest love, why should our marriage be delayed?"

"Because a stranger shall not be present at our nuptials!" said Elora, hiding her face in her handkerchief.

I ventured to kiss her forehead.

"Wretch! would you expose me?"

Then returning to her former purpose she again pertinaciously demanded my copy of herself.

"Not for all the gold in California!" I answered. "What! would you deny your lover a privilege possessed by Ariovistus Dunkelheim?"

Regardless of consequences, Elora sobbed convulsively on my bosom.

"*He* sees us," said I, gloomily; "but he cannot see his own sentence of death engraven on my heart. Farewell, my love; I go to seek Dunklehein."

And I tore myself from her presence—but I carried the magic portrait in my bosom.

CHAPTER III.

I traversed all Northern Germany, and could hear no tidings of the Professor, I saw the face of my Elora grew paler and paler in the mirror, though the reflection was as vivid as ever, and she wrote me letter after letter, announcing her unalter-

able resolution to remain single, until I had left at her feet the counterparts of the miraculous portraits.

At length, one night, I arrived at Hamburgh. The city was in flames. In the midst of the blazing turmoil, a tall man, looking cooly at the conflagration, arrested my attention. It was Ariovistus Dunkelheim. In an instant I was at his side, I laid my hand upon his shoulder, and mentally regarded him as my prisoner.

"You escape not from me," I murmured inwardly, "till my demand be satisfied."

"Ah! how are you, my good sir?" said the Professor, easily, "you have had stormy times of it since I last saw you, unless I am much mistaken?"

The coolness of the man disconcerted me. I imitated his conventional tone.

"Was my a portrait a successful one?" said I, carelessly.

"Very," replied the Professor, "not a day passed but that I amused myself by watching its curious variations, as well as those of the young lady's features. She is certainly pretty. Had you not stood in the way, I would have made her Madame Dunkelheim. I class those two portraits amongst the best of my specimens. Indeed they are great curiosities in their way, for you must know, that it is not every face that can be fixed by the magnetic process, as the pyro-luminous rays from the great mass of human bodies are comparatively feeble and scarcely capable of affecting a metallic surface, however sensitive. I would not part with those specimens for ten thousand dollars," concluded the Professor, as I thought, with vindictive emphasis, and a look of fiend-like penetration.

"Yet I hope," said I, with a painfully affected good humor, "that you will take something less, when no metaphor but actual business is in question. The fact is, I wish to purchase those portraits."

"*Why?*" said the Professor, with a look of impenetrable audacity.

"I wish to present them to some friends," was my equivocating answer.

"I can make you copies," said the Professor readily.

"I particularly wish to have the originals."

"Very good; I can take copies for myself," said Dunkelheim, "there is no perceptible or intrinsic difference between the two."

"I must request you, as a particular favor *not* to take copies; the truth is, I do not wish any stranger to possess my portrait."

"Your living spectrum, say, rather," responded the Professor. "Ah! I understand, the idea of being made the subject of scientific observation, makes you and that pretty girl you introduced to me a little nervous. I wonder a man of your intellect can be so weak. Why, let me see, did you not write the philosophic essay on *Spiritual Fortitude* and *Indifferentism to Phenomena*, in our last number of the Metaphysical Review? I despise metaphysics as a science, but I always read the Review, for the fun of the thing. Come, come, my dear sir, do not think of robbing me of the best specimens in my collection from a mere fanciful fastidiousness. I really cannot spare them!"

"Devil of a Professor!" said I, fiercely, "I do not ask you a favor; I offer you a choice: give up those infernal specimens, as you call them, of your accursed science or die at once by my hand!" and I showed the Professor the barrel of a pistol, concealed beneath the loose sleeve of my great coat.

"The fact is, I have given away your portraits," said Dunkelheim with apparent trepidation.

"To whom? villain?"

"To the Royal Society in London." Even while I paused for a moment, staggered by the awful notion of being the subject of a learned society's criticism, the Professor slipped from my grasp, and disappeared in the crowd.

I sought him in vain. A moment's recollection of his discourses showed me that his last statement must have been a mere ruse to escape. Nevertheless I wrote to the secretary of the Royal Society on the subject. But no Professor Ariovistus Dunkelheim had ever been heard of in London.

I went home, and gazed upon Elora.

CHAPTER IV.

I came to a sudden resolution.

I took writing materials, and wrote thus:

"Elora, my adored girl! the pursuit

of this devilish Professor is the occupation of a life. I am resolved to abandon it and life together, rather than suffer any longer the torments which I now hourly endure. There is but one alternative. Angel of love and beauty, save your ERNEST."

Elora's answer was brief, but decisive:

"DEAR ERNEST—Come! ELORA."

I departed for Berlin on the wings of passion and hope. For the time, I almost forgot the Professor.

We were married.

Elora was now mine. She realized in every respect my ideal of a woman. Her soul and her beauty were divine. Her fascinations were inexhaustible in their variety. But a spectre haunted us—an invisible basilisk withered our delights—an unseen hand dropped bitterness into our cup of ecstasy. The Professor—the abhorred Professor—was ever with us. Night and day, his terrible green eyes were upon us. They haunted us even in our dreams.

It was in Elora, however, that this fantastic horror became most painfully developed. My sterner manhood had developed a sort of defiant wrath, which exhaled itself in visions of revenge. Far otherwise was it with my bride. On our wedding night, Elora fainted, after exclaiming, "*The Portraits!*" in a tone of indescribable emotion. Frequently, she would start from my embrace, with the bitter exclamation:

"He sees us!"

"Let him see and envy!" once I exclaimed, with a wild attempt to turn the object of our loathing into ridicule.

"Oh, Ernest!" said Elora, sadly.

"Well, my sweet Elora, what now?"

"Were I a *man!*" said Elora, bitterly.

"He shall die!" I exclaimed, starting up from my seat, and pacing the apartment with insane rapidity. "He dies!"

CHAPTER V.

At length, after twelve months of vain inquiry and fruitless travel, I one night, quite accidentally, met the Professor Ariovistus Dunkelheim on the *Pont National*, at Paris.

He made no attempt to evade me, but said, in his usual easy tone:

"Unless I am much mistaken, you are disposed to murder me?"

"You have rightly divined my intention, Professor," said I, deliberately.

"It is unnecessary," rejoined Dunkelheim, with a sneer; "I am tired of studying the physiognomies of a couple of frightened turtle doves. I am ready to give you up my copies for the mere cost of the metal."

"I thought you had given them to the Royal Society?"

The Professor laughed.

I also laughed.

"Why do you laugh?" said Dunkelheim, with his usual abrupt assurance.

"Because you are a fool!"

The Professor became scarlet, as I could observe even by the light of a gas lamp. He gave me a look of intense and unquenchable hatred.

"I have made some discoveries in science," said he, scornftlly, as if in answer to my retort; I have also gained some thousands of dollars by my discoveries."

"You have lost your life by one of your discoveries, yet you have had daily warning for the last twelve months. You read my design, it is true, in the expression of my features, but you did not read its stern immutability. I will trust you no more; you may give me the portraits, and yet retain copies; you may deceive or elude me in a thousand ways; you may retaliate upon me throughout my life, for there dwells in you a malignant spirit—the abuse of power."

"Of supernatural power!" said the Professor, loftily and threateningly.

"No power is supernatural, for there is nothing beyond Nature," I answered, coldly. "Prepare yourself for the death-struggle!"

And, before the Professor could utter a cry for assistance, my hand was on his throat. A terrific contest ensued, for my enemy was a man of great strength and activity. But my first grip had decided the result, and in a few minutes, I had hurled the insensible body of Dunkelheim over the parapet of the bridge. It fell with a splash into the water, and I returned unobserved to my hotel.

Such things often take place in Paris. I went a few days after to the *Morgue*, and recognised the body of my former persecutor. I found out his residence, and when

his effects were sold by auction, I purchased for a few francs the two plates of metal which had been the cause of so much suffering, and of so fearful a catastrophe. The auctioneer happened to have turned them with the faces downwards, and was ignorant of their peculiar properties.

It was only when I presented them to Elora that I told her how I had killed the Professor.

"I share the crime!" said Elora, proudly. "Henceforward we are at least our own masters, and not puppets, acting for the amusement of a detestable old necromancer!"

"Yes," I exclaimed, "henceforward we are free!" and I clasped my beautiful Elora to my heart for the first time without reserve.

But still, at times, the phantom of the murdered Professor, with his cold green eyes, will haunt our fancies. I take some credit to myself for having the candor to acknowledge myself a murderer.

It is not my fault that I am not miserable and full of remorse. Elora is so lovely that, if she were to insist upon it, I verily believe I should murder another Professor to-morrow!

Nobody ever accused Ernest Darkman of pretending to be an exemplary person, so he does not hesitate to say that this story is *without a moral.—New York Sunday Courier.*

From the London Art-Journal.

ON THE HARMONY OF COLORS, IN ITS APPLICATION TO LADIES' DRESS.*

BY MRS. MERRIFIELD.

WITH regard to the variations in the color of the complexion in the human race—or rather the female part of it, for we cannot but suppose that our lords and masters have something better to do than to study the effect of colors on their complexions—it is usual to divide it into three principal branches. The first are denominated the Caucasian, or white race; the second, the red, or American Indians; and the third, the blacks, including the negroes, Malays, and other dark-skinned races. From the infinite variety of complexion which characterizes the white nations, their dress only is necessary to be studied in detail. There is so little variation in the complexions of the individuals of the other races, that the subject as regards them may be dismissed in a few words—and, indeed, were it not for the cosmopolite character of the *Art-Journal*, it would be unnecessary to advert to the colored races. We shall treat more at length on the dress of the white nations, referring occasionally to the excellent and valuable work of M. Chevreul, on the Simultaneous Contrast of Colors.

The individuals of the Caucasian, or white race, may be considered under two types—the fair and the dark. In point of color, light hair may be considered as subdued orange, modified in hue accordingly as the yellow, the red, or the brown, prevails in it. When the first color predominates, the hair is said to be *flaxen*, or *golden;* when the second predominates, it is called chesnut, auburn, or even red; and when the third prevails, the hair is simply said to be light, or light brown. The first two have always been favorites with poets and painters, not only with those of our northern climate, but in those of sunny Italy, where the dark-haired type is most common. The fair-haired beauties of the elder Palma and Titian must be familiar

* Continued from vol. 3, No. 5, p. 314.

to all lovers of painting; so much, in fact was light hair in favor on the other side of the Alps, in the sixteenth century, that the ladies were accustomed to dye their hair or discharge the color by some chemical preparation, and then dry it in the sun. Mrs. Jameson mentions having seen an old Venitian print, in which the process is represented: "A lady is seated on the roof, or balcony, of her house, wearing a sort of broad-brimed hat, without a crown; the long hair is drawn over these wide brims, and spread out in the sunshine, while the face is completely shaded. How such ladies contrived to escape a brain-fever or a *coup de-soleil*, is a wonder."

The color of the skin of fair persons may also, with the exception of the carnation tints, be considered as subdued orange, although of a lower tone than the hair; the only contrast then to general orange hue, arises from the blue or grey color, which frequently characterises the eyes in very fair complexions.

"Their eyes' blue languish, and their golden hair,"

are frequently associated in the strains of the poet. Chesnut and auburn hair are often accompanied with hazel eyes, and in this case there is no contrast, but a sort of natural harmony unites the skin, hair, eyebrows, and lashes, into one harmonious whole.

In *brunettes*, the hair and eyes contrast in tone and color with the complexion, which is generally redder than in *blondes*. Between these extremes there are an infinite number of gradations, and great variety of hue and tone, both as regards the hair and complexion. We shall allude to one of these variations only, namely, that in which the black hair, brows, and eyelashes of the dark type are united with the blue eyes and fair complexion of the *blonde*. In this class the harmony of contrast, of course prevails, although the general hue of the complexion is colder; that is to say more inclining to pink than in the *blonde*, in whom the orange tint generally prevails.

Skyblue is always considered as most becoming to fair persons, and it contrasts more agreeably than any color with the complementary orange, which constitutes the key-note, as it were, of the general hue of the complexions and hair of this type. Yellow and red, inclining to orange, contrast best with dark hair, not only in color but in brilliancy; violet, and green also, the complementaries of these two colors, do not produce a bad effect when mingled with dark hair.

We proceed now to point out in what manner the complexion is modified by its juxtaposition with draperies of the different positive colors. An incident which recently occurred affords us an apt illustration. An envelope containing some circulars printed on green, yellow, pink, and blue papers, was handed to us; we read the contents of the green paper, sitting at the time in such a position that the light fell upon the paper in the left hand, by which it was held. Having finished reading the paper (which occupied several minutes) we happened accidentally to look at the hand, and were not a little surprised to see it visibly suffused with a delicate rose color. We perceived at once that this color was produced by contrast with the green paper. In order to reduce it to a certainty, or rather to have the pleasure of observing the effects of the simultaneous contrast of colors, the green paper was changed for the pink, on which the eyes were fixed for about the same period, when, on looking again at the hand, we found the roseate hue had given place to a general blue tinge. The experiment was followed up with the yellow and blue papers, and in each case the expected result ensued. After looking at the yellow paper, the hand appeared of a purple hue, and after the blue paper, it appeared orange. The circumstance is mentioned here as affording an easy and pleasing illustration of the laws of the contrast of colors as applied to the skin, and as preliminary to the remarks which follow relative to the colored draperies and their effect on the complexion.

Pink and rose-colors cannot be placed in contact with the carnation tints of the skin without depriving it of some of its freshness; contrast, must, therefore, be prevented and the best method of effecting this is to surround the draperies with a *ruche* of tulle, which produces the effect of grey by the mixture of the white threads, which *reflect* the light, with the interstices, which *absorb* light. The mixture of light and shade thus produces a delicate grey tint.

Dark or full red is more becoming to some complexions than rose-color or pink; because, being deeper in tint than the lat-

ter, it renders them paler by the contrast of tone, for it is the natural effect of a dark color to make a lighter one in contact with it appear still lighter than it is in fact.

Light green is favorable to those fair complexions in which the rosy tint is altogether wanting, or in which it may be increased without inconvenience. Soame Jenyns, in his poem entitled "The Art of Dancing," says,

> "Let the fair nymph in whose plump cheeks is seen
> A constant blush, be clad in cheerful green;
> In such a dress the sportive sea-nymphs go,
> So in their grassy bed fresh roses blow."

Dark green, however, is more favorable than light to those complexions which incline more to red, than to rose-color, as well as to those which have a dash of orange mixed with brown; for in these cases the red tint which the flesh would receive from its opposition with light green would incline to the brickdust hue which we know is contrary to all ideas of beauty. Sir Joshua Reynolds, a first-rate authority with respect to color, and who was no mean judge of beauty, counsels the young artist, when painting a lady's portrait, to "avoid the chalk, the brickdust, and the charcoal, and to think of a pearl and a ripe peach."

Yellow is less favorable to a fair complexion than light green, because it gives by contrast, a purple hue to the skin. It causes those skins which incline to yellow rather than orange, to appear whiter, but this combination is insipid.

When the complexion inclines more to orange, than yellow, the contact of yellow drapery will, by neutralising the yellow tint of the complexion, cause it to appear more rosy. It produces this effect in persons belonging to the type with dark hair, and for this reason it is becoming to brunettes, who, like Petruchio's Kate, are

> ———"brown in hue
> As hazel-nuts, and sweeter than their kernels."

Violet, the complementary to yellow, produces effects quite opposite; thus it gives to fair skins a greenish yellow hue. It also increases the yellow tint of complexions which turn much on the yellow or orange; and it changes the blue tints to green. Violet then, is one of the most unbecoming colors to the complexion, at least unless it is sufficiently dark to render the skin paler and whiter by contrast.

Blue produces by contrast an orange tint that unites favorably with fair skins and delicate carnations, which already incline more or less to the latter color. Blue then is very becoming to many fair persons and fully justifies its reputation in these cases. It does not suit brunettes, who have already too much orange in their complexions.

Orange is too dazzling to be much worn; it gives a blue tint to fair skins, bleaches those which incline to orange, and causes yellow complexions to appear greenish.

Draperies of a dead white like cambric muslin, are becoming to fresh complexions, the rosy tint of which they vivify; but they do not suit thick and unpleasant complexions. Transparent white draperies, such as muslin, or tulle, plaited and especially disposed *en ruches*, present quite a different appearance; they seem rather grey than white on account of the contrast between the light reflected by the white threads, and absorbed by the interstices; accordingly all white draperies through which the light is suffered to pass, should be considered in their effects as grey.

Black draperies, by lowering the tone of colors which are in contact with them, whiten the skin;

> "So the pale moon still shines with purest light,
> Clothed in the dusky mantle of the night."

but if the carnations are to a certain extent separated from the draperies, it may happen, that although lower in tone, they will appear, as compared with the white parts of the skin in contact with these draperies, redder than if the proximity of black did not exist. Black should be separated from the skin by white crape or lawn, or other transparent material, which by producing the effect of grey, interposes agreeably between the black dress and the skin.

The general effect of dark colors is to make the complexion appear fairer.

All the primitive colors gain in purity and brilliancy by the proximity of grey, although not to the same extent as they do with white, because the latter causes every color to preserve the character, which it even exalts by contrast: white can never be considered as a color. This is not the case with grey, which as it may be considered a color, forms combinations with blue, violet, and dark colors in general, which partake of the harmony of analogy, whilst on the contrary it forms with colors

naturally bright, such as red, orange, yellow, and light green, harmonies of contrast. If for instance, grey be placed by the side of crimson, it will acquire by contrast, somewhat of a green hue; by the side of yellow, it will appear purplish, if by the side of blue, it will assume an orange hue; the value then of a neutral tint of this description when placed in contact with flesh is very evident. As an illustration of the manner in which grey is affected by the vicinity of other colors, the following facts may be mentioned. Let a person with very white hair be placed facing the light immediately in front of an open doorway, leading into a dark room: the hair will appear by contrast with the dark behind it, of a brilliant white; now let the person be placed near a window with a white muslin curtain behind it, the hair will by contrast with the bluish shades of the curtain, appear of a subdued and pale orange. The same effects of contrast take place with respect to the semi-neutral colors. A brown holland apron, for instance, worn over a pink dress, will assume a decidedly greenish tinge, but if worn over a blue dress it will have an orange tinge.

TO BE CONTINUED.

NEW ASSOCIATION OF ARTISTS.

BY J. K. FISHER.

A plan is now under consideration among the artists resident in and near New York, to organize an association, which, if it work as anticipated, will tend to produce a union of the whole profession throughout the United States, for the purpose of promoting the arts, and relieving artists from much of the inconvenience which now attends the selling of their works. There are also some further objects, very useful, but subordinate to these main objects.

The following is an outline of the plan:

1. A gallery to be opened in the city of New York, to remain open throughout the year; admittance free to a part of it, if not the whole. The walls to be rented in vertical strips, to artists, for the exhibition of their works. A competent person to be in attendance, to sell, or receive commissions for artists.

2. On all works sold, a commission to be charged, which is to be paid into the general fund of the association, and no part of it to be divided or drawn out until such times as are provided for in articles nine and ten.

3. The association, (if the Legislature shall authorize it) to borrow money upon compound interest, at such rates and for such times, as it may deem expedient, upon the security of its own property, and such other property as may be placed in its possession for that purpose; and to loan money to artists at whatever rate may be agreed upon.

4. The association to acquire such real estate as may be necessary for its purposes, to be paid for out of its general fund.

5. The association to open correspondence with the artistic bodies of other cities, and propose exchanges of works. And if a considerable number be established, to propose an artistic congress to be holden in Washington, for the transaction of business that the local associations cannot separately transact with efficiency and energy.

6. If the mode of distributing works of art now adopted by art-unions be legal, the congress, it is supposed, will establish a national art lottery; the prizes to consist of certificates, payable in cash to artists who have received them in payment for

their works, and available in all parts of the Union for the purchase of works of art.

7. For the purpose of promoting what is called the grand style of art, whose works are unsuited to dwellings, yet admirable in galleries and public buildings; a system of paying exhibitions to be established; the nett profits, minus a commission to the association, to be divided among the artists whose works compose them, in proportion to their respective values for exhibition purposes; the value to be determined by agreement, or by the arbitration of disinterested persons. It is supposed that the congress will be able to organize such a system, and establish such a communication between the local associations, that when an artist has deposited his work in any local gallery, it will, without further exertions on his part, be exhibited in all the galleries, and he will receive his just proportion of the profits.

8. The general fund to be the property of the artists who have contributed it by commissions upon the sale of their works, and the profits of exhibiting them. At the end of each year, or term of years, the association is to make up its accounts, and to credit each artist with a share of the profits of the term, or debit him with a share of its loss, proportioned to the amount of the commissions that have been deducted from his dues above mentioned.

9. When an artist is sixty years old, he may, if he choose, draw from the general fund, one hundred dollars per year, until all that he owns is drawn out; and if he own such an amount that more than thirty years would probably be required to draw it out then the sum annually drawn may be such as to draw the whole in thirty years. These annuities not to be transferable, but payable only to the respective artists, and to their heirs.

10. If at any time an artist is in distress, the directors, on being duly assured that it is necessary for his comfort, may permit not more than half his share in the fund to be paid to him, in such sums as they deem proper; upon condition that, as soon as able, he shall repay it with interest at the average rate which the association receives during the time it is withdrawn; and in case he shall fail to repay, the directors shall investigate the case, and if they find that his default arises from inability, they shall excuse him, and if from willfulness, they shall declare forfeited the whole or part of his remaining interest in the fund.

11. The government to consist of two classes of directors; one class to represent the persons of the association, and be chosen by vote per capita, the other to represent the property, and be chosen by vote per share; and the concurrence of both to be required to pass measures

12. All professional artists who are citizens to be members, on their compliance with the laws, and eligible to office.

The details have been discussed, and some agreed upon for presentation at the proper time. At present it is deemed advisable to propose only such general principles as are necessary to convey an idea of what is intended, for the purpose of eliciting the views of those who have not yet taken part in the consultations upon the subject, and inducing them to unite with the movement, and exercise their due influence in determining its character and constitution.

Having in the preceding articles stated the concurrent views of several of the most distinguished artists, and a great number of the most ardent and promising of the younger members of the profession, I propose to offer a few general remarks of my own, for which others are in no way responsible, although I believe they do not materially conflict with those of others interested, and in most points they will be found to agree so nearly, that more unanimity could not be expected.

Of article 1. The plan of a free gallery for the exhibition and sale of artists' works, to be supported by renting strips of wall, was adopted in London about ten years ago, and is said to have worked well. It was deemed important that the strips should be from the floor to the ceiling, because every artist is supposed to want a good place for a finished work, to show as a specimen of his ability, and a place distant from the eye, in which he may exhibit works that are only so far completed as to show their general effect, and convey a satisfactory idea to the purchaser of what they will be when finished. This is the practice of many artists now living, and was still more the practice of the Old Masters: their patrons visited them in their studios, saw their works in their incipient

state, before great expense and labor had been bestowed upon them; and when they found one whose conception and general spirit and effect suited them, they contracted with the artist to finish it. Titian, Rubens, and many others of the great masters, and many of the great living artists of England, have been in the habit of making sketches, some of them large; and commencing pictures of the full size intended—the exhibitions of the Royal Academy usually contain many sketches;—and this practice is founded on several reasons, which I shall state further on. But a free exposure of such incomplete works, except in the studios, or in a gallery upon this plan, is productive of unfavorable impressions: if a spirited work of this kind be sent to a common exhibition, and is hung near the ceiling, it is overlooked, on the presumption that it is unworthy of a better place: if it is hung so that its details can be seen, it is accounted a daub by those who, though their natural taste may be pure and well cultivated, are not connoisseurs, not competent to judge from the rough beginnings what will be the ultimate effect. In the studios this false impression is prevented; the artist shows his unfinished works in a weak light, at a proper distance, so that only their general effect, and not their details, can be seen: and if they be well commenced, this general effect is little inferior to that of the finished work; it is enough to enable the purchaser to judge whether it will accord with his feelings, and suit him; if it will, the artist finishes it, and expends upon it ten times the labor and money that have been required merely to develop the conception and general appearance; and does not fail to obtain his reward, as he might do if he finished his works without consulting the tastes of his patrons.

Titian in his studio, with emperors and princes, needed no strip of wall in a public gallery; but Titian in his early years was poor, a humble assistant of Bellini and Giorgioni; in those years no liberal patrons visited him; and a strip of wall might have brought to him the patronage of such men, and the precious time he wasted in providing for his necessities, and laboring inefficiently without capital, might have been spent with tenfold usefulness; and his days of competence might have commenced before he was forty years old. Who now can compensate the world for the lost time of that great artist, in which he might have produced many works like the Assumption, the Entombment, and others, of the middle period of his life.

He who, by his merit, after long years of labor without capital, has drawn to his studio a circle of patrons, has no longer need of a strip of wall: for him, if he be illiberal, it may be desirable that no public gallery should exist, but that he should for his remaining years enjoy the monopoly he has labored for in obscurity and poverty; but for the general interest of art—which is a part of the public interest—it is necessary that the young artist should have an opportunity to meet with patrons years before they will climb to his studio in Broadway, or still longer before they will seek him in a quiet and economical part of the town

He who, like a showman or patent medicine dealer, has spent much for factitious reputation, may dread the advent of a free gallery, with its strips of wall, to bring before his deluded customers the works of men of more delicacy and more merit; and all who possess similar advantages, and place their own immediate interests above the general good, may be grave doubters as to the practicability of combining proverbially jealous men into an organic body: but if two or three gather together in the right spirit, and persevere, others will not fail to join them; and if their growth be not rapid like the mushroom, their duration may be the longer for it.

Of articles 2 and 3. The Royal Academy of England, and the National Academy in New York, and other artistic associations, provide for the relief of that distress which is looked for as the consequence of devotion to a profession that is little encouraged. It is well to be thus provident: many artists whose fame is now established have died in distress, and left families unprovided for, whose last days might have been made comfortable, and their bereaved families for a time sustained, by funds to which their own labors had contributed. The provisions of these articles are intended to effect this object; but they have also another design, which is to prevent, as far as possible, the poverty it would relieve. By means of something like a bank, it is intended to furnish artists with such accom-

modations as all business men require, but which artists cannot now obtain, on account of the uncertain and fluctuating state of the market for their productions.

Suppose that—it is mere supposition—twenty-five per cent. commission be deducted from all that is received by the association, from the sale of works, and the profits of exhibitions; and fifteen per cent. cover the total expenses, ten per cent will remain in the general fund, to be loaned to artists only, upon the security of their works actually in possession of the association. If the amount of this fund be less than is wanted by borrowers at legal rates, it is evidently just that the highest bidders—their security being ample—should have the preference. Hence it is intended that at the regular meetings there shall be a proceeding somewhat like this:—tickets representing the amount to be loaned will be laid upon the table, for the members to take up. The minimum rate of interest, that may be got by investment in stocks, will be named. If all the tickets be taken up, and more be called for, the rate of interest will be run up, until tickets cease to be called for; those who do not wish to pay the maximum rate will throw down their tickets; and those who continue to hold will present them, with their notes of hand, and receive drafts for the money.

Should the rates be high, it would not therefore be usurious in the ordinary sense of the word; because the borrower is himself a partner in the fund into which he pays it; and because all pay the same rates, and the peculiar necessities of the few are not taken advantage of, to extort a higher rate than the fair market value of money, upon such security, renders proper. As the legislature has authorized building associations to receive any rate of interest—or, what is equivalent, any premium for a loan at six per cent—it is not doubted that this proceeding will be authorized by law.

Suppose, further, that the association holds, as security for loans made and anticipated, a number of works; and, with the consents of their owners, can borrow money upon them, from various associations who now loan their money, through savings banks, at five per cent, to wealthy men; and can borrow at a rate somewhat less than artists are willing to pay. In this case it will obviously be for the benefit of artists and the association to do so. Merchants, rather than sacrifice their goods, often pay more than the legal rate of interest, and it is deemed prudent to do so in certain cases; why then should not artists, whose necessities are often such as to prostrate their business, relieve themselves by paying the market price for such aid?

Of article 5. The well-tried system of government which Providence seems to have designed for our political affairs, appears to be our best guide in forming plans for the union and co-operation of American artists. A congress, in which all the local institutions shall be represented, may do much that cannot be done by mere correspondences, exchanges, alliances and confederations. Without dwelling much upon this point, I will ask the readers attention to the union of the railway companies in England, by which, while each retains its distinct identity and property, all the complicated difficulties of transporting passengers and goods over different lines are completely avoided; it is in some degree analogous to the union of the American states. *See Lardner's Railway Economy.*

Of article 6. If a lottery—it is hypocrisy to call it by another name—is permitted, the artistic body should avail itself of it, and not leave it in the hands of others; unless they manage it merely as a lottery for money, to be expended for works of art, and refrain altogether from attempting a direct influence upon the production of works of art, by publishing prints, or critical journals, or purchasing works, or in any other way influencing the judgment and choice of the public. The morality and taste of this mode I shall not now discuss. If they be good, it should of course be adopted; if bad, it is a power not to be left wholly in other hands; a necessary evil, to be used in self-defence, like other means of defence.

Of article 7. In no part of the world that I know is there a deeper lamentation for the low state of epic and dramatic art, than that which the members of the Royal Academy, and the united voice of English art, continue to utter. Even in that wealthy country, abounding in entailed estates of more than a quarter of a million dollars annual income, whose possessors lavishly patronize the styles suited to the

parlor and boudoir, the grand style is almost totally unaided by patronage, but still not wholly neglected by artists. Etty for many years used to paint alternately, one year a small picture of the classic pastoral style, which he would sell for five hundred guineas, and the next year a large historical or dramatic picture, which he could not sell at all, for a long time, until the Royal Scotch Academy purchased some of him, at less than half what he earned by his smaller works. West left a large gallery full of unsold historical works. Hilton painted for the love of art, and fulfilled the arduous duties of keeper of the academy for a living. Haydon died as a brave man should never die, however bitter his disappointments may be: and many others have devoted themselves, with artistic success, but utter commercial failure, to the task of placing British art on a level with that of the countries which fostered art for the sake of its aid in embellishing the temples of religion, and the public edifices of the state. But still the grand style only brings its votaries to penury: no efficient patronage exists for it; and private patronage never will sustain it, for reasons that may be comprehended if they are attended to.

Cast back your attention to the celebrated works of the Greeks, which in their original places were admirable beyond expression, and even in galleries are themes of unbounded praise; and tell which of them you would choose as embellishments for your parlor; would it be the Laocoon, the Dying Gladiator, the Belvidere Apollo, the works from the Parthenon, or Niobe and her Children? They would be out of place. Would the Last Judgment of Michel Angelo, the Peter Martyr of Titian, the Heliodorus of Raffaelle, be more in place?—Would illustrations of Shakspeare's tragedies become a lady's boudoir? Not at all. Yet in the theatre and in the gallery these subjects are legitimate, and the noblest that art has found. And, so far as we are now concerned, there is no means but the gallery to sustain such works.

That the American people are disposed to pay for seeing works that they believe to be worth their money and their attention is proved by the profits of many exhibitions. And if new exhibitions are not supported, it is because deceptions have been practiced, and worthless ones represented as good, until art itself has been brought down from the high esteem in which it was held while it was known only through books, and no miserable works had been palmed upon the public as its masterpieces, to beget the false idea that art has no power of pleasing. The natural susceptibility remains, and will remain forever; men are always more or less alive to the beautiful: and the error will disappear, and the perverted taste be purified, and exhibitions will again be thronged, whenever works that true connoisseurs can admire shall be offered to the unprejudiced public.

There is one point, not alluded to in the plan, upon which I wish to touch, and yet I fear that I may give offence. and repel the friendly aid that I would solicit: it is the influence of the press. At present an erroneous maxim prevails, to some extent, which makes the press the practical foe of art, rather than the friend, so far as this error remains unaffected by the better feelings of the conductors of this lever of public opinion. This maxim is, that all business which is promoted by the publicity of the press ought to pay for that publicity. Were this the full practical scope of the maxim, and were it not perverted, less evil might arise from it than we now find: but not only its publicity, but its praise also, is held as service to be paid for, and sometimes not accorded to those whose poverty, or modesty, or sense of honor, prevent their becoming advertising customers; nay, worse than this, in some instances works are praised which the conductors have never seen, and in too many cases the vilest trash is knowingly praised, because its possessor pays liberally for advertising, and pays a quarter of a dollar per line for notices of commendation, which are ostensibly editorial.

There is no occasion for me to argue against the abuses of this questionable maxim: but it *is* necessary to show that, with respect to the fine arts—and, I suppose, literature and the drama also—the readers of criticisms and notices should pay for them, and not those who are interested as sellers. If any man can faithfully serve two masters, to their satisfaction, he is a very uncommon man; if any proprietor of

a journal, who gets the lesser part of his profit from his subscribers, and the greater part from advertising customers, who have worthless works to sell, can resist the difference between a modest advertisement at forty dollars per year, and a profusion of boasting ones at four hundred per year, he is worthy of high honor ; but I fear that such high honor will not be generally accorded to him, while the custom is far from such purity. If the press would have its praises believed, it must place itself above suspicion, by adopting the course of the London Examiner, with respect to theatrical criticisms : it must declare that it receives no pay for them, except from its subscribers.

If a merchant advertises goods, and represents them of the best quality, there is little doubt that he speaks truly ; for he sells to competent judges, whom he cannot deceive, and who will cease to notice his advertisements if he attempts to deceive them ; but a work of art is offered to those who are incompetent judges, who purchase by faith, and who do not purchase at all, in the present state of criticism. I would respectfully submit to every journalist who notices works of art at all, that he should never permit an article affecting the reputation of an artist, or any work, to appear without the name of the writer ; and that he should take more than ordinary pains to place upon his bench of criticism judges of learning and integrity. The open way is necessary, even for the incorruptible, because the covered way is always suspected, and because the unknown writer is irresponsible, and cannot inspire confidence.

It will be said that the London Times, and other great journals, do not publish the names of their writers. I suppose the president does not put his name upon the door of the White House. But journals of humble note, and even the Times, would be more effective for matters of art, if they would work more openly.

REVIEW OF THE REPRODUCTION BY M. NIEPCE DE ST. VICTOR, OF ENGRAVED IMAGES, DESIGNED OR PAINTED.*

BY M. E. CHEVREUL.

BEFORE we go any further, I think it necessary to explain several peculiarities of an attractive power, which one must suppose is the cause of the condensing of the vapor on black objects, of which I am about to speak. However, one must not assume that the iodine vapor will be arrested by the black just as on the obturator, whilst it would filter through the white without any obstacle.

If a steel engraving is laid between the plates of copper about eight or ten minutes the picture appears on both plates. That plate which touches the right side of the picture shows the model reversed, whilst the other is in the right way. If the black was impenetrable to the Iodine vapor, and then of course qualified to the same use as the obturator, the latter picture would not be procured.

It is perfectly proved by M. Niepce that the reproduction of the picture takes place before the visible contact, an important fact for the theory of representation by M. Moser.

* Continued from page 275, Vol. 3, No.5.

Paste the wrong side of a steel engraving on a glass plate and exposes the picture to the Iodine vapor, it is evident that there is no filtration possible through the white, and that the engraving impresses its image on the plate.

If a steel engraving is penetrated with fatty ingredients and exposed to the iodine vapor it will always produce its image, only that it will be weaker than if the engraving had not been impregnated with the fatty substance.

A difference of porosity between the black and white parts we cannot explain; neither the condensing of the iodine over the one in preference to the other. In fact if an ebony rule is put against one of white wood, it produces its image on a plate of metal to the exclusion of that of the second. If a rule of the same white wood, painted with black of hatter's color is put against a rule of a pretty solid wood, it produces its image, whilst the other does not. It is then evident by this double experience that a difference of porosity is not sufficient to explain the difference of aptitude of the vapor of iodine to penetrate the two woods, the white and black.

22. I shall observe now that the image procured by the process of M. Niepce, by means of the iodide of starch, has not the stability of an image produced with ink or a lead pencil whose base is carbon. This remark does not at all lessen the merit of M. Niepce's work, for it is quite evident that if there does not now exist a means of making a double image by his process, the possibility of finding it is incontestible, and the trials commenced by the author give the hope that the obstacles are not insurmountable.

23. The color of Iodine can be modified according as the starch has been more or less baked, and the blue and violet color of the iodine can be changed by ammonia into bister or maroon.

24. If an engraving is exposed to the action of mercury and sulphur vapor; if it is impregnated by acetate of silver and mercury, by sulphate of zinc or copper, if it is passed through gum water or albumina water, it looses its property to iodize itself. But M. Niepce can restore it by very simple means, particularly by using ammonia in certain cases.

M. Niepce reproduces at pleasure the characters of the first and second side of a leaf which is printed on both sides. He has reproduced the image of a painting by exposing it to evaporated iodine, with the exception of certain colors which do not take the iodine, or which take it so as to separate themselves from it; for instance, verdigris, minium or red paint, white lead, orpine, cinnabar or red led, and ultramarine. He also reproduces colored stamps which are not gummed, when the aforesaid matters have not been used in their coloring.

25. He has made many interesting observations on the property of the iodine to adapt itself to the relievos, and to points and edges which solid bodies may offer.—Considering this property he has reproduced on metal the image of dry stamps, in some instances even on starched paper.

26. The elective affinity by which a simple or compound body drives from one of its combinations a body analogous to it in order to take its place, being found in the different dispositions of a similar vapor to combine with different bodies, or of different vapors to combine with a like body, shows that, if the iodine combines with or condenses by preference on the black part of a stamp, drawing or print, rather than on white paper, there will exist some other vapor presenting a contrary result. So that, if this vapor, after having fixed itself to the white part of the paper, disengages from it during its pressure against a surface whose matter would constitute a colored compound with it, (the vapor,) it is evident that the impression so obtained would offer the shades and lights distributed in a position reverse to those of the original image.

27. Mr. Niepce has found that by dipping black letters printed on white paper with greasy ink, in a solution of chalk hypochlorite for five minutes, and taking off the superfluous moisture between two sheets of blotting paper, and impressing them against a turnsol paper impregnated with pure water, blue letters on a white ground will result. It is therefore indisputable that the discoloring body has penetrated the white part of the paper, and has afterwards reacted on the blue matter of the paper, while it seems that it has not fixed itself to the black parts, or if it has done

so, an affinity, stronger than the one of the white paper has retained it there. Be it as it may, the effect is reverse to the one produced by iodine.

28. A vapor exposed to the heterogeneous particles of the same body, having the property of condensing itself in much larger quantity on one than on another, if it does not condense itself on the first, to the absolute rejection of the second, it is easy to see the great variety of effects susceptible of being produced by this same motive, and I especially make allusion to the effects presented by living bodies, according to the properties of the matter; which I may call organoleptic. From this, then, I adduce the possibility of the following effects:

1st. Different bodies being exposed to the same odorous matter, some will not absorb it, while others may. These last may therefore become odorous in cases where the first will not.

2nd A body possessing the property of absorbing a vesicatory vapor is distributed in a symmetrical manner on the surface of another body destitute of this property. If you expose the two bodies to this vapor and afterwards apply them to the skin of an animal, the blisters produced by this application will be the evidence of the manner in which the first body was applied to the surface of the second.

3rd. When poisons, venomous substances and miasmas, in a state of evaporation are in contact with bodies able to absorb them, and to give them up afterwards to the organs of an animal, they will be seen to be the opposites of those poisons, venomous substances and miasmas, which, being exposed in the same manner as the first, to this same vapor, without being able to absorb it, will have no action on the animals.

4th. In the three preceding cases, I have supposed the effect of vapors, which, absorbed at first by a body to the exclusion of another, disengage themselves from it afterwards; but very probably there are bodies which, after having absorbed a vapor, would not allow it to disengage itself in cases where other bodies, having also the property of absorbing it, but not having such a strong affinity to it, would allow it to disengage.

Consequently we might be deceived into the conclusion that if a body, after its contact with a vapor, does not produce any effect susceptible to denote the presence of this condensed vapor, there is no mutual affinity between the two bodies.

SECOND CLASS OF EXPERIMENTS.

Reproduction on a Polished Metallic Surface of a Stamp, Drawing, Print, &c., by the means of different elastic fluids.

29. For those who are ignorant of the results of the experiments of the first class, it would be difficult to have any idea of the effects produced by the experiments of the second class, and they therefore would be tremely surprised by them. But, if the experiments just spoken of diminish this surprise—there is at least some consolation in considering that the affinity by which they are united to the following experiments supplies the want felt by any elevated mind, who compares the knowledge just acquired with what he knew before. But, first of all, let us speak of the experiments of the second class, in order to insist upon the effects, the causes of which it is our task to explain.

30. Expose during five minutes to the vapor of iodine at a temperature of 20°, the dry paper on which is the image you want to reproduce. The vapor, as we have seen by the experiments of the first class, fixes itself on the black.

The paper thus iodized is applied for five minutes to the surface of a dry plate of copper recently polished and previously cleaned, first with water sharpened by acetic acid and then with pure water. The iodine partially at least, quits the paper for the metal. From this moment, if you uncover the plate, the drawing will appear, if you look at it in a certain direction. The lights are produced by the very surface of the metal, and the shades by a couch of iodated copper, which is heavy and of a rusty color.

Warm some ammonia fluorided in a capsule to 50° or 76°; after the dissipation of the vesicular vapor, expose to the elastic and invisible vapor the copper plate just separated from the iodated paper. Two or three minutes will do to complete the effects of the vapor.

Behold what the plate will present to the observer.

The lights where the metal was bare, bright as they were before, have become heavy and of a light grey, very different from the color of copper: the shades of the iodated copper have become more intense, so that the contrast between the lights and shades is much more prominent than it was before the contact with the evaporated ammonia, and, look at the image in any position, the lights and shades preserve invariably their respective places. But I must not forget to say that the drawing has lost its delicacy; the fine strokes have been transformed into veritable dots, like those of certain simple colored miniatures that have not been finished.

Pass a flock of cotton moistened in pure water and dipped in tripoli, on the plate in the primary direction of the polish, and the traces of the drawing will reappear, but under the incidency most favorable to the distinct sight of the image. The lights are produced, not by the surface of the pure copper, but by the surface of the metal, modified by ammonia—that is to say, that by this modification it has become heavy and of a whitish grey; as to the shades, they are produced by the copper iodated originally.

31. By passing the plate which has been submitted to ammonia in water very slightly sharpened by acetic acid, the lights would always be the copper not iodated—the shades would be the iodated copper. If you pass some tripoli on the plate, submitted to water sharpened by acetic acid, the effect would still be the same, but the shades would be less intense; the modification produced by the ammonia having been lessened. By taking water too strongly acidulated, the image would be greatly diminished, for acid at a density of 1.34 makes the image disappear.

32. Notice. Iodated paper still wet being applied to the copper plate, and when the lights of the image have been penetrated by a certain quantity of iodine, the particles of the plate's surface corresponding to the lights, take the iodine like the particles corresponding to the shades, although much less. The consequence is, that the lights of the plate, instead of the whitish grey which they would have offered in the case where the iodated paper has been applied perfectly dry, have a yellowish grey color. After having passed over the image with tripoli, the influence of the iodine on the lights is still felt, they are less bright, more heavy and grey than the copper not iodated and polished, after having been exposed to ammonia.

EXPLANATION OF THE PRECEDING EFFECTS.

33. Five years ago, had Mr. Niepce's experiments been communicated to me for an explanation of these effects, at the time, when I had not yet studied the theory of optical phenomena offered by silk stuffs, I would certainly have refused to undertake such an inquiry, obliged, as I would have been, to devote too much time to it. But having known these experiments when my former studies had sufficiently prepared me to examine them, I was able to embrace the work, which I am going to present, with some particulars undoubtedly trifling, but justified, I hope, by the novelty of the subject and the exactness of my explanation.

34. I shall begin by recalling some facts of the reflection of the light by plain metallic surfaces more or less polished, because they will be a foundation upon which the explanation I shall give of the effects observed in the second class of Mr. Niepce's experiments will be made. Take two similar plates of copper, rather long than wide, not that the dimensions have any influence on the effects I am going to speak of, but the difference of the two dimensions makes the description of these effects clearer, when they would otherwise appear comparatively obscure. Put the plates on a horizontal plane lit by the diffuse day-light, so that the spectator may see them at an angle between 20° and 40° either looking to the light or turning his back to it. The plates are placed so that the length of the one (p) be comprised in the vertical plane of the incidental light, while the length of the other plate (p') is perpendicular to the same plane. Now, looking at *p* and then at *p'*, turning your face to the light first, and in a contrary direction afterwards, you have the four circumstances, 1, 2, 3, 4, in which I have placed each sample of a stuff to determine its optical effects, as I have

studied them. (*See* The Optic Effects of Silk Stuffs, p. 18.)*

I am going to examine the effects of two similar plates for the following four cases.

First case. The two plates have been polished, in the direction of their length, with a substance coarse enough to present parallel lines, and fine, equally deep, furrows.

Second case. The two plates have been polished, in the direction of their length, with a substance pretty subtle, such as tripoli, so that they do not look like having furrows, although they really have.

Third case. Both plates have been equally lined in their length and width in a sensible manner.

Fourth case. Both plates have a perfect polish.

The results correspond to those of the third case.

There is also an identity of effect in the first and third circumstances, as in the second and fourth, but the difference is, in the fourth case that there is the highest degree of clearness and obscurity which it is possible to observe on the reflection of light by plane surfaces.

34. Two consequences may be derived from the preceding observations.

The first is, that for all metallic plates, destined to receive delicate images, the polish is an indispensable condition, but, when the polish is not perfect, the surface must have been polished in the same direction. the experiments, of which this consequence is the result, explain perfectly the reason why Daguerrean plates should be polished in one direction.

* These notes refer to a work never yet translated, and which we have never seen.—*Ed.*

The second consequence is, that to find out if a metallic surface on which no lines can be seen, has a perfect polish; it is necessary to observe it, turning one's back to the light, in order to see if it will keep the same degree of obscurity in two rectangular positions.

36. The first experiment was to find out in a precise manner, the difference existing between the surface of a copper plate polished in a longitudinal sense with tripoli, and,

1. The surface of this same copper modified by the contact of iodine;

2. The surface of this same copper modified by the contact of ammonia;

3. The surface of this same copper modified by the successive contacts of iodine and ammonia. Then upon these three plates of copper place a thick paper cut in the form of a leaf, and then after the operations to which each of the plates have been submitted, we can upon the same plates contrast the effects which we propose to define.

4. Two surfaces of this same copper, modified the one by iodine and ammonia, applied successively, and the other only modified by ammoni. To produce this two leaves of thick paper have been placed side by side on the copper plate. The plate has then been subjected to the vapor of iodine; one of the leaves has then been taken away and the plate again submitted to the vapor of ammonia.

By this means it is possible to compare the modifications produced first by the iodine and ammonia applied successively, and afterwards by the ammonia alone with the copper not modified.

TO BE CONTINUED.

NEW YORK STATE DAGUERREAN ASSOCIATION.

Rochester, *May 4th*, 1852.

THE semi-annual meeting of the N. Y. State Daguerrean Association met at Whitney's Daguerrean rooms, D. D. T. Davie in the chair.

Minutes of last meeting read and approved.

Moved that the Constitution and By-Laws be read.

Resolved, that the portion of By-Laws relating to the Committee on examination of candidates for membership be suspended, and that a Committee of three be appointed to examine all persons wishing to join this Association, and report at this meeting.

The chair appointed McDonald, Denny and Whitney.

The Committee of Investigation reported the names of S. B. Smith, of Rochester, E. P. Senter, Auburn, Thomas Elbridge, R. B. Appleby, Rochester, as worthy persons for membership, who were balloted for and unanimously elected.

Mrs. Rachel Van Lew was proposed and elected an honorary member.

A letter from the President, A. Morand, was read and placed on file.

Committee on Daguerrean Monument reported progress.

Moved, that a Committee of two be appointed to report to this meeting a plan to raise funds for the erection of a monument to the memory of Daguerre.

Denny and McDonald were appointed such Committee.

Report from Committee on Light accepted and Committee discharged.

Committee appointed to report a plan to raise funds for the Daguerrean monument, reported the following resolution.

Resolved, that each member of this Association be requested to procure a subscription book, and are hereby authorised to keep a subscription list in their rooms to erect a monument to the memory of Daguerre and solicit subscriptions for this purpose.

Resolved, that a copy of this and the preceding resolution be prepared by the Secretary, and duly signed by the President of the New York State Daguerrean Association, and forwarded to each member of this Association, and also to each worthy Daguerrean who is not a member and who is disposed to lend his aid to this worthy object.

Whitney and Senter were appointed a Finance Committee.

Moved, that the bill for printing be referred to the Committee on Printing.

D. D. T. Davie was elected Treasurer. G. N. Barnard elected Rec. Secretary to fill the vacancy occasioned by the resignation of Mr. Parsons.

Resolved, that Utica be the place for exhibiting works of art furnished by members.

Moved, by Mr. Whitney, that a vote of thanks of this Association be tendered to Mr. McDonald of Buffalo, for a double whole plate view of the City of Buffalo.

Moved, that we adjourn to meet in the City of New York on the first Tuesday of October next.

D. D. T. Davie, *Vice President.*
G. N. Barnard, *Sec.*

From the London Art-Journal.

PHOTOGRAPHY, WITH SOME OF ITS PECULIAR PHENOMENA.

ONLY a few years since, when the world was startled by an announcement that a French artist, M. Daguerre, had succeeded in producing pictures of the utmost delicacy and truthfulness by the pencil of the sunbeam, few anticipated the perfection to which the art would arrive. The pictures exhibited were, indeed, of that minute character as it regarded details, and they possessed, at the same time, such remarkable breadth of effect, that they were examined with a degree of admiration almost amounting to wonder. That the sunbeam should fix in permanence upon solid metal tablets, images of the objects it illuminated, possessed so many of the elements of natural magic that it was not surprising to find the discovery creating a more than usual sensation.

The pictures produced by Daguerre were exceedingly beautiful, but his process was confined to copying by means of the camera-obscura images of inanimate objects, and even these required the continuance of the action of sunshine for from twenty minutes to half-an-hour. In a short time, however, the process of the Daguerreotype was so far improved as to enable the photographic artist to execute in a few seconds pictures, which surpassed in excellence those which had required a prolonged exposure to solar radiations. Keeping pace with the improvements of the Daguerreotype, we find, in this country a regular advance in all those photographic processes on paper—the introduction of which are due to Mr. Fox Tabot—until at the present time we have sensitive surfaces spread on paper and on glass, which are susceptible of receiving with all the rapidity of the lightning's flash faithful delineations of moving objects. It was thought by our experimental philosophers that a few salts of silver and of gold were the only metallic compounds which were sensitive to the chemical agency of the sunbeam. It is, however, now shown that every substance is either mechanically or chemically disturbed by each passing ray of light, and many of the phenomena which attend these changes are of the most curious character. The process which was introduced for the production of pleasing pictures alone, has led us to a knowledge of many of the more subtile phenomena of Nature. By pursuing the suggestive results which the processes of sun-drawing have opened up to our view, we have discovered many of the secrets of the progress of vegetable growth; we understand more thoroughly than we did before the physical agencies upon which depend the geographical distribution of plants, and, without doubt, of animals; although our means of determining by exact experiment the sequence of influences, in the way we can do with plants, are limited when we carry our experiments to the higher organizations. Lavoissier, the French chemist, wrote these remarkable words in a prophetic spirit:—"The fable of Prometheus is but the outshadowing of a philosophic truth; where there is light there is organization and life, and where light cannot penetrate there Death for ever holds her silent court." Every advancing research shows us more and more strongly the truth of this; and, although there are yet a few cases of doubtfulness—and one or two which appear opposed to this statement—there are strong reasons for believing that the chemical agency, as well as the heating power of the sun's rays, can penetrate where the luminous principle cannot reach, and that these solar forces produce or maintain that low order of vitality which is found in those animals existing buried deep in mud, or in the deep gloom of cavernous lakes.

But confining our attention to those changes which are connected with inorganic matter, we will briefly examine the results of the active experimental researches of the few years just past.

It has been proved that LIGHT—the luminous principle of the sun-beam—is not the agent by which the Daguerreotype or calotype pictures are produced; that indeed photography or light drawing is not a correct expression. All the phenomena of chemical change on metallic salts are pro-

duced by a class of solar rays which excite not the organs of vision—they are dark invisible radiations, producing not even any calorific effect. Niepce—one of the very earliest investigators proposed the name of *Heliography* or sun-drawing to distinguish these results—and certainly, that term would have been much less liable to objection. Our researchers have shown us that light may be regarded as an interfering or opposing agency, and that, under certain conditions, all chemical change is stopped under the most intense illumination, while under others, with scarcely any light, the rapidity with which chemical change takes place is extraordinary.

It follows from this that care is required in the selection of subjects, since the colors of surfaces materially influence their radiations, and, consequently, determine the quantity of light—or actinism, as the chemical principle has been termed.

As a familiar illustration of what takes place, we will suppose a lady, desirous of having a photographic portrait of herself, has the following peculiarities, and wears in her dress the colors named.

Possessing a somewhat jaundiced face and yellow hair—we will imagine her to wear a dark blue bonnet—and, not remembering if we shall offend against Mrs. Merrifield's laws of the "Harmony of Colors in Ladies' Dress," we will allow our fancied fair one to wear a violet silk dress, a purple mantilla, and give them an abundant trimming of yellow or bright gold color. The Daguerreotype or calotype portrait of such a lady would have a *dark*—almost mulatto face and black hair, the dress and the mantle would only be different tones of *white*, and the yellow trimming an intense *black*. This peculiar result—which we should never expect by any system of *a priori* reasoning, is proved to be dependent upon the interfering influences of light—those colors which produce the most intense illumination giving the smallest amount of chemical action and the contrary.

It is thus that we are enabled to explain the fact that photographs are less readily obtained under the brilliant light of summer than in the more subdued illumination of the spring. Thus it is also that there is much greater difficulty in practising photography in the inter-tropical regions than in the temperate zones of the earth. The conditions of the atmosphere most materially influence photographic effects: in the atmosphere of this metropolis it is not at all uncommon for a slight yellow haze to completely obstruct all chemical change. It has also been observed that a very sensible difference exists between the photographic or actinic effects of the solar rays two hours after noon, the morning sun being by far the most chemically active.

The peculiarly subtile agent with which we work is actively employed in the great operations of Nature; and, in producing pictures on the plates of the Daguerreotype—or on the paper or glass of any of the photographic processes—we are only imitating that which is constantly going on in the laboratory of the organic and the inorganic creations.

Within a very short period of time, many most remarkable improvements have been made in photography, and the promise of yet greater perfection in the resulting pictures is rendered more certain of speedy fulfillment. The *Art-Journal* has from time to time recorded the steps of progress as they have been published, so that its pages may be referred to for information by all who desire to pursue this interesting study.

Amongst the most recent improvements introduced, the collodion process must be regarded as one which promises to be the most successful practised, and to give the best results. A communication from Mr. Peter Fry, who has devoted much attention to photography, and particularly to this process, has been forwarded to the *Art-Journal*, and, as it involves some points of considerable interest, it has been chosen as a text upon which to hang a few remarks in connexion with the processes on glass generally.

"As you are desirous of obtaining a statement of my mode of proceeding with regard to the addition of gutta percha to the usual collodion mixture in the photographic process. I feel much pleasure in forwarding it.

"Take a thin solution of Archer, Horn & Co.'s collodion mixture to which add one-third of a solution of gutta percha. To make the solution of gutta percha, put some small pieces of this substance into sulphuric ether, and at the expiration of four or five days it will be sufficiently dis-

solved; or put some of the collodion mixture into a gutta percha bottle, and in a few days it is fit for use. I consider this the preferable mode of obtaining the gutta percha solution.

"When the liquid is perfectly fine, it is poured in the usual manner over the glass, and, when set, the glass is placed in a bath of nitrate of silver, 30 grains to 1 oz. of water, where it should remain one minute. On taking the glass out of the bath, in order to obtain a *negative* picture, it is to be placed at once in the camera; but for a *positive*, it should be blotted with the finest bibulous paper. Immediately the moisture has been observed the film becomes firm, and it may be placed at once in superposition to a glass or a waxed negative. The picture having been taken (*which in strong gas light can be done in one second*), pour some water over the surface, to allow the developing solution to flow freely over it. The image can be brought out with great beauty by using the following solution:—

1 drachm of a saturated solution of protosulphate of iron,
1 drachm of distilled water,
10 drops of nitrate of silver (30 grains of nitrate of silver to 1 oz of water),
10 drops of acetic acid.

"Should the picture prove tardy in its development, throw off the sulphate solution, and, after slightly washing the plate, pour over the surface a saturated solution of bichloride of mercury, four times diluted with water. Immediately it has flowed over the glass, wash and fix the picture by immersing it for some time in a bath of a saturated solution of hyposulphite of soda.

"The principal advantage derived from the use of gutta percha in negatives, is the increased tenacity which it gives to the film, by which a greater facility of manipulation is obtained, as, with the addition, the plate may be subjected to repeated washings, and lengthened immersion in the hyposulphite bath. Whether the gutta percha possesses in itself any photogenic property must be left for further experiments to determine. I have no doubt that many other salts of silver will answer better than the iodide introduced into Archer, Horne & Co.'s collodion process; and also that pyrogallic acid, proto-nitrate of iron, and other developing agents, may prove equally, if not more, advantageous for developing the image but the recipe I have given will certainly enable parties to make beautiful negative as well as positive pictures.—P. W. Fry."

That the film of collodion and iodide of silver, formed on glass plates exhibits a higher degree of sensitiveness to the action of the chemical radiations from the sun, than the ordinary calotype process on paper is certain. We have, therefore, to inquire to what cause this increased sensibility is due. It was discovered by Count Rumford, that carbonaceous compounds possessed the power of reviving silver and gold from their solutions in a very remarkable manner, that even an exposure to *heat* in the dark was sufficient to effect the decomposition of these metallic salts and hence he was disposed to attribute the chemical change to *heat*, rather than to *light*. Experiment has proved that in many of the chemical changes produced by sunshine, the heat-rays played an important part; and some calorific rays, having a peculiar decomposing power, have been detected, which appear to exert some specific functions which distinguish them from the ordinary heat-rays. These are particularly active on the coloring matter of leaves, and they produce peculiar changes upon many other of the hydrocarbon compounds.

On paper the actinic (photographic) change takes place on iodide of silver, with an excess of nitrate of silver, and an addition of gallic acid. On the glass we have the very remarkable compound, collodion —gun-cotton and ether, which exhibits many most peculiar properties, and none more striking than its electrical condition.* Now, if a mixture of collodion is added to a solution of nitrate of silver, we find that it quickens its decomposition by the sun's rays in a most remarkable manner. We may therefore infer that the increased rapidity of action, which is manifested by the compound of iodide of silver and collodion, is due to the peculiar conditions of the gun-

* If a film of collodion is stripped off from a glass plate which can be done without difficulty, it will, when held up by the finger and thumb, exhibit electrical attraction and repulsion with most surprising energy, crackling under the fingers, and giving luminous flashes in the dark.

cotton compound, and its property of being affected by radiant heat, as well as the chemical radiations. Whether the solution of gutta percha in ether increases the sensibility is a little doubtful; certain it is, that it gives more tenacity to the film, and thus renders it less liable to be injured by the manipulatory details necessary to ensure the permanence of the picture.

It has been denied that any gutta percha is dissolved by the ether. The mistake has arisen from the circumstance that the ether dissolves out one of the proximate constituents of the gutta percha, a kind of vegetable wax. Any person putting gutta percha and ether together, and allowing them to stand for a few days, will find upon pouring it over a glass plate, that it will on evaporating leave a fine semi-transparent film, proving the fact of the solution of, at least, something contained in the gutta percha. Indeed, by mixing a little iodide of potassium with the solution in ether, it may be employed to obtain pictures in the same way as the collodion film.

The development of the dormant pictures by the use of gallic acid, pyrogallic acid, proto-sulphate, and proto-nitrate of iron is a subject which has received less attention than it merits, and from a misconception of what takes place, many false notions prevail as to the bearing of patent rights upon the use of these materials. Gallic acid was first employed as a developing agent by Mr. Fox Talbot; its action depends upon the eagerness with which it seizes oxygen from many of the metallic compounds, so that by applying it to the sensitive surface which has been already acted upon by the solar rays, we set it to work in carrying on what has already commenced. The heliographic influence has commenced a decomposition of the silver salt, and of course the gallic acid first attack those parts of any prepared surface which has already suffered the largest amount of chemical change. All those parts therefore which were subjected to the greatest degree of illumination, are the first to undergo the process of de-oxidation, metallic silver being revived in a state of extremely fine division. Now, whether this organic acid be employed, or any of the other chemicals named, the action is precisely similar. Proto-sulphate of iron I believe to be by far the best developing agent which can be employed, when proper care is taken; it acts in the same way, by taking oxygen from the silver as does the gallic acid. There are a great variety of chemical compounds which possess this property to a greater or less extent, but in all of them the effect is produced by precisely analogous chemical reactions.

As the protonitrate of iron has been very strongly recommended, it may not be uninteresting to give Mr. Ellis's ready method of preparing it:—

A few lumps of the protosulphuret of iron must be placed in a glass vessel, with an ounce or two of cold diluted nitric acid —of one part acid—of commercial strength, to three or four of water, poured over them. Decomposition of the sulphuret slowly ensues with the evolution of sulphuretted hydrogen gas. As this gas is extremely offensive, it is better to place the vessel in the open air for some hours, until the whole of the nitric acid is saturated. A protonitrate of iron is now contained in the solution, and it may be decanted from the impurities at the bottom of the vessel and filtered. As thus obtained, the liquid contains its own volume, or nearly, of sulphuretted hydrogen, absorbed during the evolution of the gas, and it is consequently manifestly unfit for the purposes of photography until this impurity is expelled.— The most effectual plan is to expose it in a very shallow vessel to the air; its decomposition rapidly ensues, and in a few hours no trace of the gas, either by the smell or the usual tests, can be discovered. This, and the protosulphate of iron, may be employed equally upon the collodion, or the albuminised glass, and upon paper, with many advantages.

Another mode of preparing the proto-nitrate of iron, is to add a solution of ordinary sulphate of iron to nitrate of barytes; double decomposition takes place, and a pure proto-nitrate results if the chemical equivalents have been attended to.

Mr. Archer to whom we are mainly indebted for the use of the collodion, has lately published an account of a very remarkable action of corrosive sublimate (bichloride of mercury) on the photographic picture, when developed by any of the previous processes. This peculiar action was first observed by the author of this paper, and published in the "Researches on

Light," in 1844, having been previously communicated to the Royal Society in a memoir on the Influence of Iodine on Argentine Preparations; but Mr. Archer arrived at the discovery by perfectly independent steps, and has observed a peculiarity which had not been noticed previously.

The collodion picture being devoloped, a solution of corrosive sublimate is poured over it. The first action is to blacken all the parts already darkened, and thus give a greater depth to these parts, or generally to increase the intensity of the image. If the mercurial solution is poured off at this point, we have a greatly improved negative picture. This discovery is entirely due to the industrious examination of Mr. Archer. If, however, the solution is allowed to remain on the picture, it gradually becomes obliterated, and presently re-appears in a most magical manner, a white precipitate falling upon all those parts which were previously dark. By this means, what was a negative image is converted into a positive one; and, if backed up with black velvet or black varnish, produces a most effective picture in the strong contrasts of black and white. Anything more beautiful than these changes cannot be found within the range of chemical science; they possess a species of natural magic of the most attractive kind. The chemistry of the change is, in all probability—though the problem must not be considered as solved—that the bichloride of mercury parts with one equivalent of its chlorine to convert the darkened silver—first, into the dark subchloride, and subsequently into the white chloride—the insoluble chloride of mercury, or calomel, falling upon these parts, and thus changing the character of the picture.

The general beauty of the pictures produced by the collodion process, which Mr. Fry has improved by the introduction of the etherial solution of gutta percha, is such that we feel satisfied it will tend greatly to advance this very charming scientific application, and render it of the highest importance to artists, as enabling them to select choice examples of nature, which they may transfer to their canvas. We have seen some collodion pictures produced by Dr. Diamond, far surpassing anything yet obtained. We shall publish the process next month.

We learn that M. Le Gray has found very considerable advantage in using a weak solution of chloride of gold as a fixing agent. His practice is to place his picture after it has been developed in water containing but a few drops of the chloride of gold. He imagines some gold is precipitated on the darkened parts of the picture. After this it is placed in the ordinary solution of hyposulphite of soda, and treated in the ordinary manner. The use of potash, as recommended by Mr. Malone, appears to promise a greater degree of permanence than the gold, since it is a peculiar property of the gold salts that they go on changing for years, and thus tend to give the paper an increasing violet hue.—Robert Hunt.

PHOTOGRAPHY IN ROME.

IT occurs to me that some few facts respecting the state of Photography in Rome may not be without interest to those of your readers who take a delight in this beautiful branch of Art; and as many of my photographic acquaintances have frequently expressed a wish that I would publish the method I adopted for making negatives during a four month's residence in the Eternal City, I have thought it best to forward a familiar letter on the subject for insertion in your journal—should you deem the communication of sufficient importance. In the first place a word about Roman photographers. I need hardly say that their places of rendezvous are the Lépre and Caffè Gréco. It will be as well to mention the names of those who are always accessible to the photographic artist, and who readily communicate their experience and practice, with a view, reciprocally, to gain instruction. Foremost, I must place Mr. Robinson, well known to all artists and amateurs of every denomination in Rome. I cannot

speak too highly of his courteous bearing towards a stranger who introduces himself as a follower of his favorite pursuit. I am quite sure that any English gentleman would meet with as much assistance as I myself did. Then there is the Prince Giron des Anglonnes, Signor Cavena, M. Constant, and M. Flacheron (this formed in 1850 the photographic clique), and on the whole their method of manipulation is attended with more success than is generally met with in this country. I would recommend any one visiting Rome, with the intention of following this absorbing pursuit, to repair at once to the Caffè Gréco, where, with a little attention, he will soon recognise his own vernacular in the conversation of those in the central compartment, and, by singling out a bearded *habitue*, the chances are, that he at once pounces upon the right man, or at any rate, finds himself in close quarters with the English photographer, whose acquaintance is an introduction to the party.

I will now proceed to the point, and *imprimis*, must state that when I left England I could make a good negative on paper by the usual method introduced by Mr. Fox Talbot, and, consequently, with much expectation of success, prepared a large quantity of iodized paper of the average strength as stock. It is almost needless to say with what anxiety I looked forward to the arrival of my apparatus, which had been sent from England by sea; and will not take up your space by describing the many distressing failures I encountered day after day, with the same batch of paper as that used in England. Every modification which my ingenuity could suggest, I tried, but without success. I bought and prepared fresh English paper, and excited it with the most homœopathic doses of silver, but still the amount of sensibility was so great, the state of the atmosphere so rare, and the effulgent light of a southern sky so intense, as entirely to preclude the possibility of obtaining a negative strongly impressed in the pores of the paper. The time required to produce a picture on paper iodized in the ordinary way, being so short as to admit of its surface only being acted upon, and this faint kind of negative will not give a good positive. I persevered, however, for a whole month, although repeatedly assured by Robinson and the Prince that they never could do anything by what they termed the dry method. This I found to be the case; and as my productions were far inferior to theirs, I tore up some fifty negatives, and commenced *di nuovo*. Whilst at Tivoli, in company with the Prince and Signor Caneva, with whom I worked for ten days, I learnt the following method, and ever afterwards pursued it, uniformly with success; and although the process is not new, it requires to be carefully explained. My own negatives will bear me out in the statement that this method far excels any other for hot climates.

1st. Select old and thin English paper, —I prefer Whatman's: cut it in such a manner that a sheet shall be the sixteenth part of an inch smaller than the glass of the paper-holder on every side, and leave two ends, at diagonal corners, to the sheet, by which to handle it.

2nd Prepare the following solution:—

Saturated solution of iodide of potassium $2\frac{1}{2}$ fluid drachms; pure iodine, 9 grains; dissolve.

Then add—distilled water, $11\frac{1}{2}$ ounces; iodide of potassium, 4 drachms; bromide of potassium, 10 grains; and mix.

Now filter this solution into a shallow porcelain vessel, somewhat larger than the sheet of paper to be prepared. Take a piece by the two diagonal ends, and gently place the end of the marked side nearest to you, upon the surface of the bath; then carefully incline the surface of the sheet to the liquid, and allow it to rest two minutes; if French paper, one minute, or until the back (not wetted) becomes tinted uniformly by the action of the dark-colored solution. Raise it up by means of the two ends occasionally, in order to chase away any air bubbles, which would be indicated by white spots on the back, showing that the solution in those places has not been absorbed. Hold the paper by one of the ends for a minute or so, in order that the superfluous moisture may run off, then hang up to dry by pinning the one end to a string run across a room, and let the excess drop off at the diagonal corner. When dry, the paper is ready for use, and quite tinted with iodine on both sides. It will keep any length of time, and is much improved by age.

3rdly. I will presume that four sheets

are to be excited for the camera, and that the operator has two double paper-holders, made without a wooden partition, the interior capacity of which is sufficiently large to admit of three glasses, all moveable. The third, as will be seen, is to prevent the two pieces of excited paper coming in contact with each other.

Prepare the following solution :—

Take of nitrate of silver, 2½ drachms; acetic acid, 4½ drachms; distilled water, 3½ ounces; mix and dissolve.

Now take four of the glasses of the paper holders, perfectly clean, and place each upon a piece of common blotting paper, to absorb any little excess of liquid. Pour about 1½ drachms, or rather more, of the solution just prepared, into a small glass funnel, into which a filter of white bibulous paper has been placed, and let the solution filter, drop by drop, upon glass No. 1, until about 1½ drachms have been filtered in detached drops, regularly placed upon its surface; then, with a slip of paper, cause the liquid to be diffused over the whole surface of the glass. Take a piece of prepared paper, and place its marked side downwards upon the glass just prepared, beginning at the end nearest you, and thus chasing out the air. Draw it up once or twice by its two diagonal corners; allow it to rest, and prepare glass No 2, in a similar manner. Now look at glass No. 1, and it will be perceived that the violet tint of the paper has become mottled with patches of white, which gradually spread, and in a few seconds the paper resumes its original whiteness, which is an indication that it is ready for the camera. It will be found to adhere firmly to the glass. Do not remove it; but hold up the glass to allow the excess of fluid to run off at one corner. It must not be touched with blotting paper, but replaced flat upon the table. Serve Nos. 2, 3, and 4 in like manner.

Take four pieces of common white paper not too much sized, free from iron spots, and cut a trifle smaller than the prepared sheet; soak them in distilled water; draw out one piece; hold it up by the fingers to drain off superfluous moisture, and place it gently upon the back of the prepared paper, glass No. 1. With another piece of glass kept for the purpose, having the edge rounded, and large enough to act uniformly upon the paper, scrape off gently the excess of liquid, beginning at the top of the sheet, and removing, with the rounded edge of the scraper, the liquid to one of the corners. Repeat this operation twice. Both the excited and superimposed paper are thus fixed to the glass. Proceed in a similar manner with glass No 2. When the two first glasses are thus prepared, take the clean glass, No. 5, and place upon glass No. 1. Press gently; the moist paper will cause it to adhere. Take up the two glasses thus affixed, and place them upon glass No 2, in such a manner that the supernumerary glass No. 5 shall be in the centre. The whole will now form a compact body, and (having polished the surfaces and wiped the edges) may at once be put into the paper-holder. It will be seen that each piece of excited paper is backed by a piece of paper moistened with distilled water, and having a third glass intervening to prevent the papers touching each other. To prepare the four sheets—with a little practice—it will take half an hour.

4thly. With a Ross's, Chevalier's, or Lerebour's single lens—three inch diameter, and a half-an-inch diaphragm—the object to be copied, well lighted by the sun, the paper will require from four to six minutes' exposure.

5thly. Take out three glasses, which will still firmly adhere; separate them gently, and remove the pieces of moistened paper, which must not be used again. Now lift up the prepared paper by one corner, to the extent of half the glass, and pour into the centre about one drachm of a saturated solution of gallic acid, which will immediately diffuse itself. Raise, also, the other corner, to facilitate its extension; and serve the others in like manner. The image takes, generally, from ten to twenty minutes to develop. Hold the glass up to a candle, to watch its intensity. When sufficiently developed, remove the negative from the glass. Wash in two or three waters for a few hours; dry with blotting-paper, and immerse each, separately, for ten minutes, in a bath of the following solution :—

Bromide of potassium,	10 grains,
Water,	1 ounce.

Then wash in water, and dry. The iodide may be removed by means of hyposulphite of soda, in the usual way, twelve months

afterwards, or when convenient. If the process has been carefully conducted, four beautiful negatives must be the result. I was ten days working incessantly at Pompeii, and scarcely ever knew what a failure was.

Although the process of exciting the paper may appear somewhat tedious, it must be borne in mind that the operation of iodizing, as usually followed in this country, is entirely dispensed with. I may add that the first solution requires to be charged with a little more iodine after preparing a dozen sheets as the starch and size of the papers absorb it very greedily. Two or three sheets of French paper, which, I believe, is sized almost entirely with starch, are sometimes sufficient to decolorise the solution—forming an iodide of starch.—Richard W. Thomas.—*Art-Journal.*

GOSSIP.

THE present number closes the third volume of the Photographic Art-Journal, and, although its subscription list, compared with the number of Daguerreotypists in the United States, is small, yet we have been gratified by a steady increase to its number. Our task as editor is an arduous one, and by no means a pleasant, but we have endeavored to fulfill it in a manner to do justice to all. We have, during the eighteen months of our publication, presented to its readers an amount of scientific and practical knowledge, that would have cost them in any other form twenty times the amount of money expended upon it, and we feel that we have at least done our duty, if we have not more than fulfilled our promises.

To those who have encouraged us both by their contributions and subscriptions, we tender our thanks, and we only regret that there are so many still so blind to their own interests as to suppose that works of this kind can be of no benefit to them. We do not pursue the publication of the Photographic Art-Journal for any pecuniary advantage to ourselves, as aside from our pledge to devote our portion of its income to its sole usefulness, which pledge we can show we have faithfully kept, it is actually a source of many fatiguing and harrassing midnight hours of arduous labor, which we can only expect to see requited by the actual benefit the daguerrean art may derive by its elevation in the estimation of the public mind and the respectability of its followers. But alas! when we see so many paltry, insignificant, unclean and ruffianly things brought into it by the catchpenny—and we may say vile advertisements, of equally vile—advertisers, who hold out inducements they know can never be realized, and who unscrupulously filch the last dollar from their victims, under the plea of instruction, we almost despair of ever eradicating the evil which hangs like an incubus about the daguerrean art.

How the respectable portion of Daguerreotypists can look upon this desecration of their beautiful art in silence, and not raise a finger to suppress it we cannot imagine. How they can take so little in-

terest in the only means of eradicating the vile system we cannot divine. Would that we had the eloquence of a Paul, or a Demosthenese, to arouse them from the apathy into which they have fallen! In the name of Daguerre where is your self-respect, where your dignity? Why do you sleep, and suffer your art to degenerate into a mere Peter Funck business to minister to the vicious propensities of a low set of swindlers, most of whom do not pretend to take pictures, but depend entirely upon an unprincipled system of instruction for a livelihood?

Is it not your duty—we would ask—to denounce this wholesale robbery, daily occuring in the city of New York and other places, to the public? You can never expect to make the art truly respectable or secure a high position either in society or the arts, until you purge yourselves of the miasmas these rotten carcasses are constantly exhaling around you.

We have frequently had occasion to speak out our sentiments on this subject before, we hoped sufficiently severe, but we find it is necessary for us to dip our pen in gall and wormwood, and lash the rascals bare backed around the world; for we are sickened by the very looks of things in the shape of men who call themselves daguerreotypists, and whose only chance for existence is to dupe poor silly mortals by advertising falsely, and by practices of the most unlawful duplicity.

Those who have watched the current events of the past few months in the daguerreotype world will readily understand the tendency of our remarks, and point out that class of operators to whom we allude, and also the means for correcting the evil they entail upon the business.

There is but one way for men of standing to act in the premises. We have endeavored repeatedly to impress our readers with the absolute necessity of fostering a well organized society, and it makes us sick at heart when we hear the paltry excuses made by men, whose judgments should make them ashamed of them, for not giving more of their attention to the associations now in existence, and who seem determined that they shall fall stillborn into the lap of time. The noble few who assembled at Rochester last month should put to the blush all those who are constantly crying out against the miserable botches that surround them, yet who do not put forth the slightest effort to sustain the dignity of their art.

We copy the following from the *London Art-Journal*, as pertinent to the subject:—

In directing the attention of our readers to the prospectus of a Photographic Society which appears among the advertisements, little need be said concerning the wonderful results to be expected from the development of an Art as yet in its infancy.

Those who pay attention to the subject are well aware of the infinite uses to which, as a knowledge of its principles becomes more diffused, it will of certainty be applied, but the readers of this Journal will naturally feel greatest interest in considering the relations which it bears to the fine Arts.

Offer to the artist—after he has spent a morning in the fruitless attempt to dispose around the stiff dull inanimate lay figure, a cast of drapery that shall be full of grace and suggestive of life,—a means by which he can obtain an instantaneous representation of draperies that shall of themselves have fallen into natural, and therefore pleasing, combinations of lines and masses around the limbs of a living model; by which he can obtain an image perfect, even to the smallest detail and minutest reflected light, if so he wish; or presenting, if he desire it, nothing but the broad masses of light and shade; he will instantly welcome it as an invaluable economy alike of time, talent, and temper. Or when the portrait painter endeavors in vain to fix upon the canvas the happy curl of the mouth, and laughing sparkle in the eye which he noticed "when dining the other day" with the sitter in the chair before him,

whose lips now looked as if they had never been parted to speak an intelligent expression, and whose eyes are now fast sinking into a state of mesmeric listlessness;—what would he not give for a method which should enable him in an instant to fix for ever the image of that momentary glow of the eye and joyousness of the features which precede the utterance of a pleasant thought? And yet this can be done with a certainty even now; how much more so when the Art shall have attained the perfection which awaits it. What then are the causes why it is so little used in practice among artists and why so many of those who have commenced the study have abandoned it as a waste of time? The reasons are simple, for, first, the expense of an apparatus that shall be of practical use is so great, when compared with the moderate means of most of those who depend on Art for their daily bread, that it acts virtually as a prohibition to its use. But a greater hindrance still, is the length of study required to attain the requisite skill of manipulation in the processes hitherto usually employed, and the loss of time even to the skillful operator, caused by the complication of those processes themselves.

That the first of these difficulties, the great price of the apparatus, can be altogether removed we do not attempt to maintain. Doubtless a superior lens will always command a superior price: but is it not certain that if the number of those who practise the Art were by any cause very materially increased, and if also a ready means were provided of bringing before their notice, any improvements that might from time to time be made, that the natural working of competition would soon not only lessen the price, but also increase the excellence of the photographer's first purchase, the lens and camera. To do away with the other hindrance, that which has most prevented the extension of photography among artists, viz., the length and difficulty of the processes employed, is, with the avenue opened out to us by the use of collodion, a much more simple and speedy affair.

In the results produced by the use of collodion on glass there will be of course degrees of excellence, since here, as elsewhere, patience and practice will produce their usual fruits; but the process itself is so simple that even the most awkward manipulator will be able to obtain by it not merely a sketch but a perfect representation of difficult attitudes of the human figure, and of fugitive combinations of drapery.

For the landscape painter this process is not quite so applicable; the difficulty of conveying on his sketching excursions the requisite quantity of glass acts as a bar to the use of collodion. For him there remains the various modifications of the prepared paper. These occupy time and require for their success a greater amount of care and delicacy of handling but there are indications of improvements in the preparation of sensitive paper, as for example Le Gray's new wax paper, which need only to be developed to render photography as docile a servant to the painter of landscape as of figure pictures.

To collect around one common centre all the practitioners of this Art is the object of the proposers of the Photographic Society. It will form a focus towards which will converge all the discoveries or the improvements made by individuals in all parts of the country, and which now are exposed to be lost, or at best to become only partially known. The facility afforded for communication among the members will powerfully stimulate the efforts made by manufacturers to produce cheap and excellent apparatus, pure chemicals, and papers of suitable quality, and it will form the natural and accessible source from which students may derive instruction in the principles of the Art and explanations of the difficulties which they may encounter.

We are happy to state that considerable progress has been made towards the establishment of the Society, and that its success may now be considered as certain. We would especially urge upon artists to lose no time in qualifying themselves to join it. A knowledge of the principles, and familiarity with the practice of photography, will put into their hands a key by which they may unlock the hidden mysteries of Art. Much may be said upon this subject; it was ably touched upon in an article on the stereoscope in the last number of the *Art-Journal.* It would require however more expansion and illustration than can be given to it in this notice, and we must for the present content ourselves

with aiding to form a Society, out of which enormous benefits cannot fail to arise.

— Our readers may look for a rich and racy account of Mr. Brady's visit to Europe, from his own pen, in our next number. Mr. Brady had promised its commencement for this number, but he was unable, from a press of business, to prepare it in time. Mr. Brady spent several months in different parts of Europe, visited all the notorieties in the daguerrean art, and is prepared to open a very entertaining budget for the benefit of our readers.

— We have been favored by Mr. Hesler, of Galena, Ill., with five beautiful specimens of his art, of the illuminated style, which, however, we do not much affect—but of which the *Galena Advertiser* discourses as follows :—

Another Achievement in Daguerreotyping.—The reader may remember that some time since, we noticed a very great improvement in daguerreotyping, which had been made by Mr. Hesler, of this city. That improvement was that he had succeeded in giving a back ground to his pictures, as clear and soft as the finest India paper, on which the light and shade showed like the lines in the finest engravings. He has kept on since that time experimenting, and yesterday we had the pleasure of witnessing his greatest triumph. The pictures now appear with the same soft, clear back ground, but the line of back ground is broken by a circle of rays in which is exhibited *all the tints of the rainbow*, in regular prismatic succession. This invention lends an additional charm to the portraits of ladies and children. The best daguerreotype we have ever seen was one of those shown us yesterday, that of a young girl of twelve. We congratulate Mr. H. on the success that attends his experiments, and we venture the expression, that he is on the high road to fortune.

It is a style well calculated to please, and will, we trust, be the means of abundantly increasing the store of this worthy and enterprising artist. The gem of the specimens sent us, however, is the quarter plate, entitled the "Cousins Morning Call." It represents two blithesome, lovely girls, enrobed for a morning walk, and is most exquisitely and artistically conceived and executed, and has been pronounced by all good judges to whom we have shown it a most perfect specimen of the Photographic art. Mr. H. will please accept our thanks for his favors.

— We have also received some very fine specimens of Photographs upon paper, taken by J. A. Whipple of Boston. In most respects they are far better than the French pictures we have seen, either of European or American origin. Mr. Whipple has certainly led the way to a demonstration that it is only necessary to place the means before our American photographers to cause them to excell in paper as well as in metallic photographs. The enterprise of this most energetic and excellent artist should meet its due reward. Is there none in New York to emulate him?

— We should like to know what keeps M'Clees & Germon, and Root, of Philadelphia, Cook of Charleston, Long and Fitz Gibbon, of St Louis, and a host of others among our best artists throughout the country so quiet? Can it be possible that they suppose we care nothing about them besides getting their five dollars? Come, gentlemen, let yourselves be heard occasionally.

— The Union Head Rest.—Mr. W. A. Allen has in this chaste and beautiful article—an engraving of which we give in this number—presented his daguerrean friends with a piece of furniture for their operating rooms, unsurpassed by anything of the kind in this country. It is a befitting companion for his elegant camera-stand, a description of which we gave in

our March number. His Union table stand is equally rich, and in the same style, to correspond.

— There is some of the spirit of momus existing among our western daguerreotypists as may be seen from the following advertisement which we clip from a Louisville paper. Mrs. Partington gets roused up, also, occasionally, by these gentlemen.

A Card.—Some of our friends having asked us how we came to let friend Hewett get the start of us in so great an improvement as the Nephlographic Pictures, we would inform them that a Mr. John A. Whipple, of Boston, got about four years the start of friend H., the former having patented the above description of pictures in 1849. He calls them the "Crayon Daguerreotypes." Our friend H. is entitled to much credit for having *discovered* a new *name* which is certainly a great *improvement* to the picture. He is as well pleased at his success (judging from the "massive columns of editorials, puffs, &c.) as though he had really found a "mares' nest." Now we can prove that we produced the same description of pictures two months ago, but we had *no right to sell* them, nor has Mr. H. Still, if he can do so, "who's afraid;" we can give you any kind of of a picture ever taken on a daguerreotype plate. Yours, &c.,

Webster & Brother,
No. 479 Main street.

— We have the pleasure of presenting to our readers, this month, the liberal offer of Mr. Anthony of 308 Broadway, N. Y., of a massive silver pitcher for the best full sized daguerreotype to be executed previous to the first of November, 1853. We can assure our friends that this offer is made in good faith, and in that truly liberal spirit towards the art for which Mr. Anthony is well known. The pitcher is to be made by the celebrated house of Ball, Black & Co., and will be perfectly illustrative of the subject for which it is designed as a prize. We shall give an engraving and description of it in a future number.

Premium for the best Daguerreotype.—One year since, I offered a reward of *five hundred dollars* for the greatest improvement that should be made in the Photographic art during the year 1851. No applications of any importance were made for it, probably in consequence of the natural modesty of inventors. Inasmuch, however, as the money has been offered, I consider that it no longer belongs to myself but to the Art. Therefore, with the advice and consent of Professors Renwick, Morse and Draper, who were appointed the judges in the matter, I have decided to invest the above amount in a MASSIVE SILVER PITCHER, of appropriate design, to be awarded as a prize for the best large daguerreotype that shall be offered for competition previous to November 1st, 1853.

No competitor will be allowed to exhibit more than one Daguerreotype.

The Daguerreotype offered for competition must be on what is called the full size plate, $6\frac{1}{2} \times 8\frac{1}{2}$ inches.

Every competitor must be a member in good standing of some one of the various Photographic Societies.

A description of the method of operating in the production of the picture offered, must accompany each picture, mentioning the brand of plate and the makers of the various chemicals used, as far as the operator may be able to tell.

In order that there may be no complaint as to impartiality, the pictures must be sent anonymously, accompanied by a sealed package containing the name of the artist and the method of operating. The pictures and sealed envelopes will be marked with corresponding numbers in the order of their reception, and the latter will only be opened after the decision of the judges.

Artists of all countries are invited to send pictures for competition.

All letters of inquiry upon the subject will receive prompt attention, and it is earnestly hoped the competition will be as spirited as possible.

All who intend to compete for the prize should send in their names as early as possible, as lists of the competitors will from time to time be published.

The pictures must be forwarded to my address, free of expense.

E. Anthony,